ELECTRICAL REVIEW

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Future Requirements

A Forward Step in Planning

It is an open secret that during the war this country's generating capacity has been added to considerably in order to meet the enormous demand for power for industry. Not only have existing stations been extended, new ones have been put into commission. Consequently it might be thought that the problem at the end of the war would be how to employ all this plant. In actual fact the release of the pent-up public demand is expected not merely to fully load existing facilities but to call for still further extensions to power stations, as well as distribution systems.

At present there exists only a hazy idea of the extent of the demand which may be anticipated in the post-war period. Some estimate can be made of what may be called the " deferred " load, that is the amount of business which would have accrued under the normal rate of development. But in addition to this it is firmly believed that the public's greater acquaintance with the possibilities of electricity, gained in various forms of war work, will result in a very considerable acceleration of the rate of progress.

Indication of Prospects

Everybody engaged in any branch of the electrical industry would welcome a reliable indication of the prospects, although any estimate must be made with little idea of the possible conditions after the war. Consequently the Electricity Commissioners are doing useful work in attempting to gather from electricity supply undertakings information regarding their future plans, even though their forecasts are extremely provisional.

The primary purpose of this investigation is to enable the Commissioners to provide the national planning authorities with some idea of the materials and labour which will be required, but it might be made to serve other useful purposes. The questionnaire sent to the undertakings asks for particulars of deferred maintenance and repair work ; estimates of capital expenditure in extensions of and connections to existing mains; possible transmission and distribution extensions; and consumers' apparatus.

Wider Application

Manufacturers would be glad to have some of this information to assist them in gauging the size of their future home market and the amount of material and labour which will be involved. The electrical contracting industry would also be interested to know the extent of possible future business. For these reasons it may be hoped that the information obtained will not be regarded as secret but issued in suitable form for publication in due course.

In their letter to the supply undertakings the Commissioners say that information regarding the provision and extension of new selected generating stations is being obtained from the Central Electricity Board and the North of Scotland Hydro-Electric Board. Presumably the Boards will first be furnished with the results of the Commissioners' inquiry to afford them guidance in framing their own estimates.

In presenting the industry's forecast of

its requirements the Commissioners will no doubt impress upon the appropriate authorities the title of the industry to full consideration in the matter of priority. Its potential contribution to the restoration of peacetime activities and to the higher standard of living which is aimed at should give it as good a claim as that of any other industry.

Codes and Regulations

IN this issue we publish a statement regarding codes of practice, particularly as they relate to the I.E.E. Wiring Regulations, to clear up some confusion which appears to exist. From this it will be seen that the effect of the codes, which set up a standard of good practice, thus raising them above the minimum requirement level, is to stress the need for additional basic safety regulations, with a supporting code of interpretation. By this means, as the I.E.E. Post-War Planning Committee has said, fundamental principles will be separated from the details of application.

Uprating Overhead Lines

THE use of rotary condensers for reducing reactive drop on high-voltage overhead lines has proved of great value in enabling supplies to be given to dispersed war industries. A notable example is provided by the Derby & Notts. Power Co. (J. N. Robertson, *I.E.E. Journal*, Vol. 90, p. 51, No. 27). In ordinary times the expenditure on plant of the full output theoretically required might be uneconomic, but it is usually unnecessary to specify this, as Mr. W. R. Holland shows in this issue, provided the machine is appropriately designed and full advantage is taken of tap-changing on associated transformers. The condenser rating needed in practice may by this means be lowered to a figure at which the method becomes feasible in point of cost in many instances that might not immediately suggest themselves.

Fuel Economy

IT is evident that the coal situation is not improving and that increased military activity, making additional calls upon transport, will further increase the difficulties. In these circumstances the Ministers of Production and of Fuel and Power have jointly circularised over 30,000 factories pointing out that it will not be possible to build up stocks during the summer to the same extent as formerly and this must be counterbalanced by even greater economy in use. The services and advice of the Regional Controllers are offered and an appeal is made to managements and workpeople to do all in their power to reduce coal consumption and employ substitutes. It is further pointed out that if the average turn-round of wagons could be reduced by one day it would give the equivalent of an increase of 10 per cent. in the country's carrying capacity.

Saving Electricity

DOMESTIC, as well as industrial, economy in fuel is still imperative and the Electricity Commissioners have addressed an appeal to all electricity supply undertakings to take every opportunity of impressing this need upon all their consumers, particularly where consumption is rising. The Commissioners give due credit to E.D.A. for its national economy campaign but ask undertakings to back this up in their own localities reminding them that E.D.A. is prepared to afford them a great deal of assistance in this very necessary work.

Generation Trends

WAR exigencies have necessitated the stabilisation of steam conditions in Great Britain at the general standard for new plant installed in the 1930's, *viz.*, round about 650 lb. per sq. in. and 850 deg. F., for which special alloy steels are not required. Recent metallurgical developments make it reasonable to expect that, with the return to normal international relations, there will be an evolutionary advance to the next associated range of 1,400 lb. per sq. in. and 960 deg. or so. This view coincides with that generally held in the United States, where (as indicated on another page of this issue) no radical change in the technique of generating electricity is envisaged.

E.P.E.A. and C.E.B.

THE Electrical Power Engineers' Association has protested to the Minister of Fuel and Power against his omission to consult the Association and other electricity supply interests in connection with the recent changes in the personnel of the Central Electricity Board. It recalls that when the Board was appointed in 1927,

the Minister of Transport invited the E.P.E.A. and, it is believed, the manual workers' trade unions to suggest nominations. The E.P.E.A. had proposed Alderman W. Walker and it is considered that this had much to do with Alderman Walker's appointment. It is made clear that the Association raises no objection to the appointment of Sir Percival Bower, whom it regards as "most suitable and worthy." The protest is entirely a matter of principle, as the 1926 Act is held to oblige the Minister to consult all the interested parties in making appointments to the Board. It may be said that these interests are wide and diverse, including local government, electricity, commerce, industry, transport, agriculture and labour. Consultation with all of them would present a pretty formidable task.

Power Engineers' Pensions

AT the January meeting of the National Executive Council of the E.P.E.A. it was unanimously decided to approach the electricity supply companies, through the National Joint Board, with a view to securing the adoption by the companies of superannuation schemes more in line with those in operation by local authorities. The possibility of legislation being required was mentioned and the opinion was expressed that "it was high time the very essential reform was instituted and company undertakings were required to set their house in order in this respect." So far as the power companies are concerned it would seem that no difficulty should arise, for in its recent memorandum upon reorganisation the Incorporated Association of Electric Power Companies recommended "that pension schemes having a prescribed minimum scale should be made compulsory on all retained undertakers, unless this matter is adequately dealt with by general legislation."

Overcoming Disablement

MUCH credit is due to those industrial concerns who are endeavouring to restore to useful employment those who, through the war or accidentally, have been incapacitated. A good example of what can be done is provided by Foster Transformers & Switchgear, Ltd., whose report on the subject to the Local Employment Committee is mentioned in this issue. Blind persons, particularly, have been trained in a number of useful occupations and in many cases have been found superior to those still able to see. Ingenuity has also been displayed in dealing with workers who have suffered the loss of limbs. A one-armed man, for instance, has been provided with a special face shield and has proved a very efficient welder. Emphasis is laid on the need for providing *productive* work so that the disabled person will feel that he is in no way inferior to his more fortunate colleagues.

Discharge Detection

WITH the probability of an acceleration of the tendency towards the employment of higher voltages, the line of research described in last week's I.E.E. paper by Dr. A. E. W. Austen and Dr. W. Hackett has become of great importance. One of the most important issues raised is the adequacy of power-factor measurements for indicating ionisation of occluded gases that might lead to dielectric failure. Ionisation may possibly not provide the only reason for phase-angle increase and there are other causes of breakdown than heating. As the authors state, specific methods of discharge detection are necessary. They are likely to be even more so under future conditions.

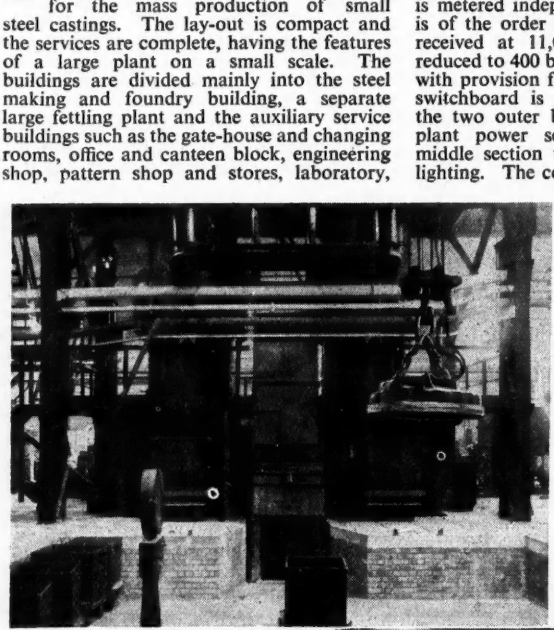
Preference Share Conversion

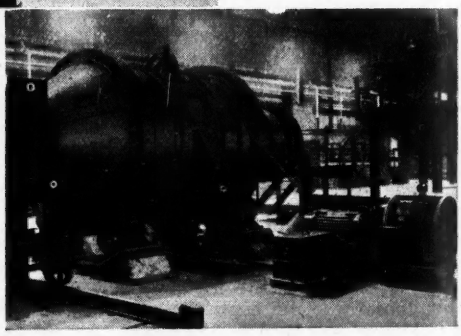
A POINT of general interest to investors is raised by the proposal of the Powell Duffryn Steam Coal Co. to liquidate the company for the purposes of an amalgamation and to offer ordinary shares in the new concern to the holders of the company's preference shares, regard being paid to the premium at which the preference shares stand. Preference shareholders have protested at what they regard as a reduction of security and it has been suggested that they should have been offered the alternative of the market value of their shares in cash. The chairman, when moving the resolution approving the scheme (which was adopted) said that in the event of winding-up, which might occur at any time when the shareholders holding the requisite voting power so decided, rigid adherence to the contractual rights of the preference shareholders could be insisted upon. In this case, however, they were being given greater consideration. The point has been referred to the Company Law Amendment Committee for its consideration.

Modern Steel Making

Electrical Applications in a Self-contained Factory

THE subject of this article is an interesting example of a self-contained factory for the mass production of small steel castings. The lay-out is compact and the services are complete, having the features of a large plant on a small scale. The buildings are divided mainly into the steel making and foundry building, a separate large fettling plant and the auxiliary service buildings such as the gate-house and changing rooms, office and canteen block, engineering shop, pattern shop and stores, laboratory, boiler house and sewage plant. In the centre of the lay-out is the main substation with the compressor house nearby, the load and supply being centrally balanced.





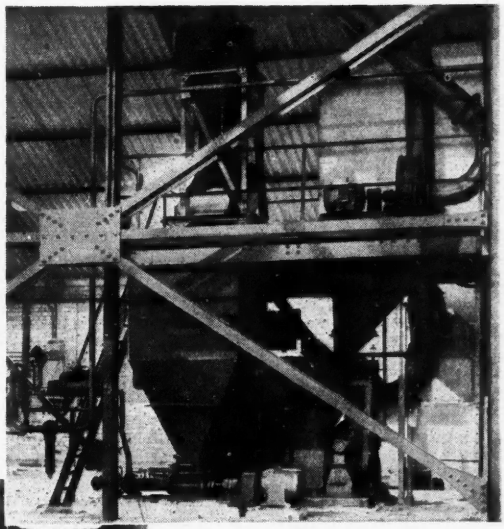
Above: The raw materials are magnet handled (right) and the metal-filled bins are elevated by a central hoist to the top of the cupolas
Right: The rotary furnace turns first one way and then the other, and final transmission is by chain anchored round the furnace shell periphery; slag bin on left

The electrical distribution scheme is divided simply into steel making, foundry and fettling sections, each of which has sub-distribution boards in the plant adjacent to the loads. The external services are maintained on a separate system which also controls the main lighting, so that the power sections of the factory can be isolated completely and essential services maintained independently during non-working hours or in emergency. The main and sub-distribution boards are all of the h.r.c. fuse type, and each of the main sections is metered independently. The power input is of the order of 500 to 1,000 kVA. It is received at 11,000 V, and the voltage is reduced to 400 by two 500-kVA transformers, with provision for a third. The main 400-V switchboard is divided into three sections, the two outer bars being conneeted to the plant power sections described, and the middle section to the external services and lighting. The compressor motors, which are designed for power-factor correction, are disposed equally on the outer sections to balance the reactive loads.

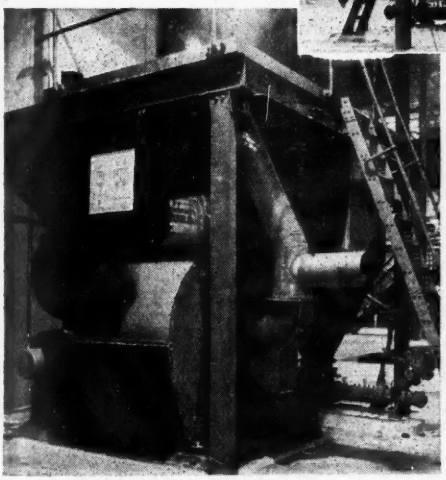
The raw pig-iron and scrap are brought by railway into a stockyard bay within the steel plant building, in which it is packed into skips by a 5-ton electric overhead magnet crane with a driver's cab. The crane motor sizes are 35 HP for the hoist, 10 HP for the long travel and 2½ HP for the cross travel, all running at about 725 RPM. They are all one-hour rated slip-ring totally enclosed crane-type motors operated by drum controllers. The electric brakes are AC solenoid operated. For lifting scrap a standard 45-in. circular magnet is provided and supplied with DC from a 3½-kW motor generator on the crane structure. The skips are wheeled into an enclosed inclined charging hoist which

conveys them to the charging position near the top of two cupolas. The hoist is automatic and after pressing the start button the skip is propelled to the top, tipped and, after a pause, returned to ground level where it stops for withdrawal and replacement by a full skip. The entry to the hoist is closed by a door interlocked with the control gear, which prevents operation until the moving parts are safely enclosed. The hoist motor is a one-hour rated 7½-HP, 750-RPM slip-ring totally enclosed machine with an air-break contactor controller mounted a little away from the operating part of the plant for convenient maintenance.

The two cupolas are blown by separate fans driven by 25-HP, 2,900-RPM totally enclosed squirrel-cage motors, with oil-immersed direct-on starters, mounted on the charging platform. The air flow is regulated by valves and checked by an air-volume recorder and pressure indicator. Adjacent to the cupola plant is a brick store and grinding plant in which new refractory material is prepared. The grinder is of roller type with bevel gear transmission and driven by a 15-HP, 725-RPM slip-ring totally enclosed motor, with an oil-immersed stator and rotor starter.

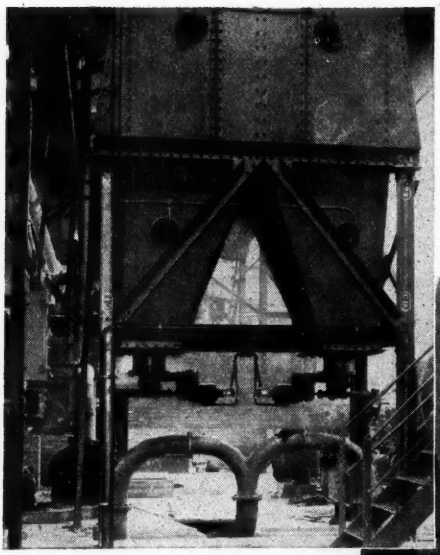


A fan (top) blows fuel-laden air into a storage bin and a worm feeder (bottom) passes the fuel to a pipe line serving the classification bins



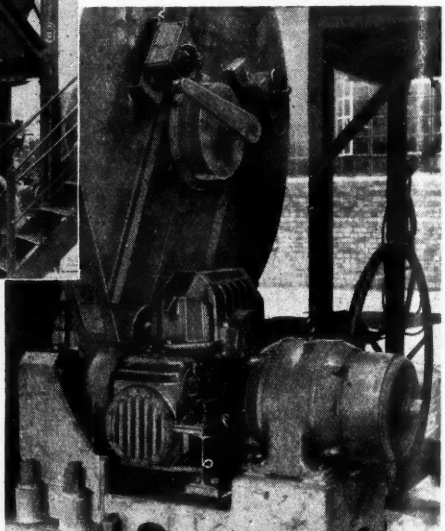
The liquid iron from the cupolas is transferred by ladle to a rotary furnace for superheating. The furnace is of the horizontal type supported on rollers, and is electrically rotated by chain transmission reduction gears driven by a 6-HP, 580-RPM, two-speed totally enclosed squirrel-cage motor. Rotation is reversed by a screw limit switch which is adjustable so as to vary the arc of revolution from one turn to half-a-turn in either direction. The furnace is fired with pulverised fuel which is blown into one end of the furnace and supplied from a special pulverising plant in the building. Raw coal is delivered by a hand-operated skip to a ball mill driven by a 20-HP slip-ring motor. Preheated air from a local gas- or coke-fired furnace is drawn into the mill by a fan which also serves to blow fuel-laden air into the pulverised-fuel hopper for storage. The fan is driven by an 8-HP squirrel-cage motor. The fuel is transferred from the storage bin to the furnace pipe line by a worm feeder driven by a 7-HP squirrel-cage motor with push-button control. This drive has a centrifugal friction clutch for starting.

Coal for firing the rotary furnace is pulverised in a ball-type mill; an illuminated mimic diagram of the fuel-bin system indicates high- and low-fuel levels



Small DC motor-driven feeders regulate the flow of fuel from the classification bins; transmitters control the motors of the coal-feeding equipment and the indicating lamps

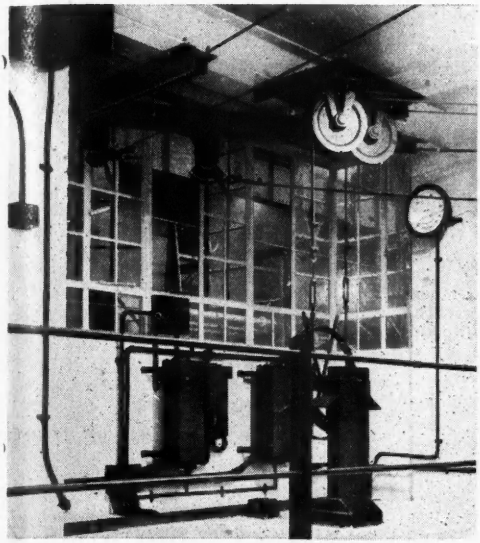
Thence the fuel is blown by compressed air to the furnace feeding bins through a valve which is electrically operated by a ½-HP geared squirrel-cage motor. The fuel is classified and stored in local bins which serve the furnace through electrically driven feeders driven by ¾-HP special DC geared motors. The fuel is finally blown into the furnace by a constant-displacement Connersville blower driven by a 15-HP, 1,500-RPM, V-belt driven variable-speed AC commutator motor with induction-regulator control. The control of the fuel blowing, feeding and rotation of the furnace is centralised in a combination control panel which houses the air-break contactor equipment for the motors, and on which are mounted the furnace operating instruments and the remote electrical controls.



Actual alloying is effected in the converters, one of which is shown tilted (left). The converter tilting motor is automatically switched off at the tilted and upright limits by limit switches on the tilting equipment (above)

A small motor-generator set is provided for supplying DC for the feeder motors. The starters for the pulverised-fuel plant motors are standard oil-immersed and air-break star-delta and direct-on

types mounted together on a framework with a distributing fuseboard and common isolator, adjacent to the mill. A feature of



The converters are operated from a platform in a separate room commanding a clear view of the plant

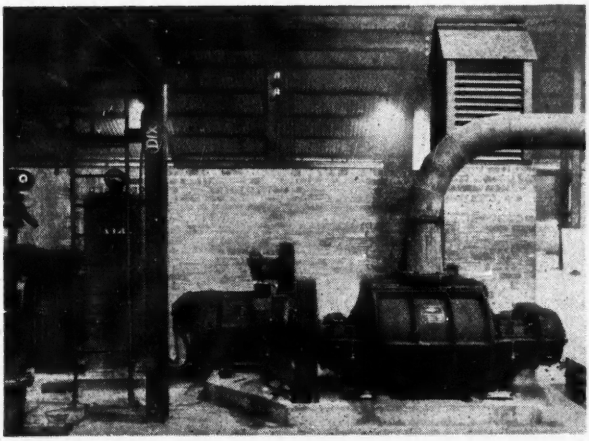
interest here is the illuminated mimic diagram showing the fuel-bin feeding and classification system. The weight of the fuel in the bins operates diaphragm switches which automatically control the feeding motors and operate the indicating lamps on the diagram.

From the rotary furnace the superheated iron is charged

The main blower for the converters is driven by an AC commutator motor with induction - regulator speed variation control

to steel converters by ladles, after being weighed on an adjacent weighbridge. The converters are blown normally by a constant displacement Connersville blower situated in a separate blower house. The blower is multiple V-belt driven by a 55-HP, 1,400-RPM variable-speed AC commutator motor with induction-regulator control. This is normally remotely controlled by a push-button station with top and bottom speed indicating lamps mounted in the window of the blower house which overlooks the plant. It is noteworthy that the induction regulator and contactor control panel are coupled together by metal trunking to form a very compact unit with the minimum of external wiring. All the cabling is run under the floor in trenches and tubes. There is also an auxiliary emergency blower of the simple turbo type driven by a 110-HP 2,950-RPM, slip-ring induction motor, with an oil-immersed starter, and space is left for a second main blower. The difference of HP between the main constant displacement blower and the constant pressure auxiliary blower is of interest, and the former, although higher in first cost, has but half the operating cost.

The converters operate for blowing in the vertical position, but require to be tilted forward for pouring in the liquid charge, pouring out the molten steel after blowing and fettling the lining between heats. The tilting drive has a double-reduction gear for the very low-speed working and is



electrically operated by a 4-HP one-hour rated slip-ring motor, with a drum-type controller. Each motor is of the totally enclosed crane type and runs at 955 RPM. The drum controller is

of the standard air-break type and is mounted, together with an oil-immersed stator circuit-breaker, in the window of the converter blower house alongside the blower controls. Over-running is prevented by limit switches, and for emergency there is a "dead man's" pedal switch which stops the motor if released. Occasionally the converter vessel is turned nearly upside down for emptying its contents into the pit or for repairs, in which case a push-button is provided which cuts out the forward limit switch. For relining, the whole vessel is removed by jacking it off its trunnion bearings hydraulically and running it forward on rails for handling by the crane.

The general arrangement of the rotary furnace controls, the separate blower house and grouping of the converter controls in the blower house window are a definite advance in small steel making plant practice, combining efficiency of operation with good working conditions.

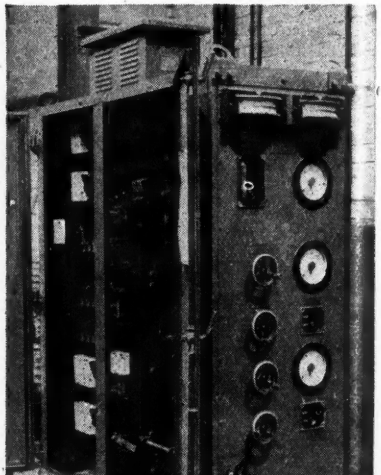
Ladle-handling Cranes

Ladles in the steel making bay are handled by two overhead electric cranes, one 30-ton and the other 5-ton. The former is equipped with a 60-HP, 585-RPM hoist motor, with contactor control, a 35-HP long-travel motor, and a 10-HP cross-travel motor. The last two motors both run at 725 RPM and are served by drum-type contactors. The 30-ton crane is employed chiefly for lifting and upending the rotary furnace and converter bodies into the relining pits. The 5-ton crane is exactly similar to the stockyard crane previously described, and is employed for handling ladles in the bay, supported by the 30-ton crane, as required. All the down shop conductors have isolators mounted near the access ladders and clear duplicated warning lights for safety.

To complete the plant are gas-fired ladle drying burners with small electric blowers, and a manganese crusher of the jaw-type driven by a 14-HP, 1,450-RPM totally enclosed slip-ring motor, with an oil-immersed stator and rotor starter. With the exception of the blower motors in the blower house all the motors throughout the plant are totally enclosed to suit the rough service conditions.

The lighting has also been designed to give the best conditions for efficient operation and safety by adopting part overhead and part side lighting, while there is adequate local lighting in the dark corners and under the platforms. Handlamps are required at a number of places for inspection and work inside the vessels. The plug points are protected on the Butcher-Black & Decker earth-leakage system, which represents a distinct advance towards safer working conditions.

In a second article we propose to describe the mechanised foundry and the fettling section of this plant. The installation work was carried out by John Richards & Co. (Electrical Engineers), Ltd., to the design and under the supervision of H. A. Brassert & Co., Ltd., consulting engineers for the whole plant.



All the motors associated with the rotary furnace are controlled from a contactor cabinet

Manufacture in Eire

OUR Dublin Correspondent reports that the Irish electrical trade has noted with interest a statement by Mr. Lemass, Minister for Industry and Commerce, that as much as possible of the equipment needed for the £20,000,000 rural electrification scheme will be manufactured in Eire.

The main articles produced at present are the Solus Teoranta lamps (at Bray, co. Wicklow), and a large series of electric cooking and heating accessories, including irons, fires, immersion heaters, and other domestic apparatus manufactured by Aibleisi Eireannacha Teoranta (Ardee, co. Louth). It is unlikely that heavy apparatus such as transformers for the new stations could be produced economically in Eire, but it is thought that there are greater possibilities with regard to insulators, switches, etc. Mr. Hamill, chairman of the Aibleisi Co., is reported to have stated that when rural Eire is electrically developed there will be a market for domestic appliances sufficient to provide employment for about 500 men working on mass-production lines. At present, with materials very scarce and new installations severely limited, from fifty to sixty men are kept employed.

Synchronous Condensers

Increasing Transmission-Line Loadings

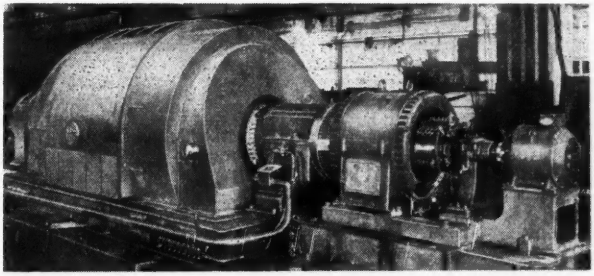
By W. R. Holland, B.Sc.

ONE of the problems now facing electricity supply undertakings in Great Britain, of which the war has been the immediate cause, is that of delivering increased amounts of power over existing transmission systems. In view of the dispersal of industry, large blocks of load, instead of being concentrated in and around the big towns are often to be found in the heart of the country, far from generating stations. While this particular aspect of the problem is due to the war, it would be short-sighted to assume that peace will bring about a return to pre-war distribution of industry. In any case even the domestic load will increase as soon as the factories are able to make the domestic appliances which were selling so readily in 1939. Thus the undertakings supplying rural areas may expect to find their present transmission lines and transformer capacity scarcely adequate for the demand which has been rapidly growing during the last two or three years. The question then arises as to how existing transmission systems can effectively transmit more power to the boundaries of their areas.

Wattless or reactive current taken by induction motors is detrimental to voltage regulation, as well as reducing the load capacity of transmission lines due to the increase in the total current. As the neutralisation of this reactive current is the primary requirement, perhaps the first solution that springs to mind is power-factor correction by individual consumers. Already much has been done in this respect by high-power-factor rebates or by tariffs based on kVA, so that further inducements to consumers may hardly be economically justifiable. If the average load power factor is already reasonably high—say, 0·8 to 0·85—little more can be expected from the user, and any further improvement must be made by the undertaking. In such a case, the synchronous condenser with automatic control will often be found to give the solution.

In this country in the past, synchronous condensers have been but rarely installed, and in almost all cases have been used for power-factor correction by consumers in order to obtain power-factor rebates or the equivalent. Their use by a supply undertaking itself, however, is for a different purpose. When connected to the lower-voltage side of a transformer at a distribution centre and controlled by suitable automatic gear, a synchronous condenser can maintain substantially constant voltage at that point—an important and valuable feature—whilst increasing the load capacity of a transmission line and its associated step-up and step-down transformers.

To understand this dual purpose, consider a simple transmission system consisting of a step-up transformer supplied from constant-voltage busbars, a transmission line and a step-down transformer at the receiving end. Neglecting the charging current of the line, which in the case of short lines is small, and the magnetising current of the transformers, also small and opposite in effect to the line-charging current, the system then consists of three impedances in series, which can be added vectorially to form a single impedance. On no load, the voltage at the receiving end of the line is the same as that at the sending end and, conversely, a current at a leading power factor will in general cause the received voltage to rise above that at the sending end.

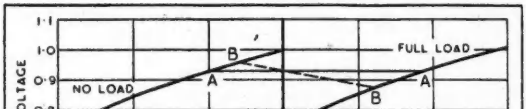


A 15,000-kVA, 11-kV synchronous condenser recently built for indoor installation, with fully automatic starting and synchronising, and with automatic voltage-regulator control; total losses at rated kVA approximately 250 kW

Since a synchronous condenser can be caused to draw from the line any current within its rating at approximately zero-lagging or zero-leading power factor by varying its field excitation, such a machine connected to the receiving busbars and having suitable field control arrangements would

enable the busbar voltage to be controlled and given any desired characteristic irrespective of the value and power factor of the load current supplied by those busbars.

In practice this amounts to a synchronous condenser of suitable kVA rating with its field supplied from an exciter, usually direct coupled, the value of field excitation being controlled by an automatic voltage regulator responsive to the busbar voltage at the receiving station. A machine of normal design can operate over the range from 100 per cent. of its rated kVA at zero leading power factor to 50 per cent. at zero lagging power factor. If the rated kVA is sufficiently large, the voltage can be maintained constant from no load to full load of the transformer, although sometimes that may not be economically justified, especially if on-load tap-changing equipment is also provided.



Effect of condenser load on receiver busbar voltage

Sending busbar voltage = 1·00 ; line, etc., impedance on 24,000-kVA base = 0·06 + j 0·32; load, 17,500 kVA at 0·8 lagging power factor; AA, 9,600-kVA condenser (9,600 lead — 4,800 lag) maintains constant received voltage = 0·930; BB = 6,000-kVA condenser (6,000 lead — 3,000 lag) gives received voltage = 0·915 ± 0·043

Typical Example

Consider a typical case of a generating station supplying mainly a local load but where an industrial load has grown up in a rural district thirty-five miles away. The generating station busbars operate at constant voltage, and transmission is at 66 kV. The capacity available at the generator busbars for additional load is 24,000 kVA at 0·833 power factor or 20,000 kW. There are step-up and step-down transformers at each end of the line, which consists of steel-reinforced aluminium cable, equivalent to 0·2 sq. in. copper conductor. The total impedance of the circuit between generator busbars and secondary side of the step-down transformers is 0·06 + j 0·32 per unit (*i.e.*, 6 per cent. resistance and 32 per cent. reactance at rated current of 210 A).

If a load of 14,000 kW at 0·8 power-factor lagging (17,500 kVA) be taken from the receiver busbars, the equivalent generator output at 66 kV must be 207 A, or 23,700 kVA at 0·651 power-factor lagging, and the received voltage is only 0·74 of the no-load voltage. Such conditions are inadmissible for two reasons; first, the generator cannot deal with such a low power factor at the full-load current and, secondly, the voltage regulation is excessive. However, if to the receiver busbars is connected a synchronous condenser rated at 9,600 kVA and capable of 50 per cent. of this rating at zero-lagging power factor, then for a received load of 14,000 kW at 0·8 lagging power factor, the generator output will be 132 A or 15,070 kVA at 0·966 power-factor lagging. The received voltage at no load with the condenser operating at lagging power factor will be 0·930 of the previous no-load value, and at full load with the condenser operating at leading power factor will be identically the same.

From the above, four important points emerge.

(1) Constant voltage can be maintained on the receiver busbars by field regulation of a suitably rated synchronous condenser connected thereto.

(2) The voltage drop in the line (including transformers) is reduced to about one-quarter of the drop without condenser.

(3) The line current is reduced to about 63 per cent. of the uncorrected value, so that the load-carrying capacity of the line has been considerably increased.

(4) The power factor of the current at the generator busbars on full load is improved from 0·651 lagging to 0·966 lagging.

These results have been accomplished by the use of a synchronous condenser rated at 9,600 kVA. In practice, a considerably smaller condenser would be satisfactory, first, because a small drop in receiver voltage with increase of load would be permissible and, secondly, on-load taps could be provided on the transformers to cater for a limited amount of voltage regulation. If allowances are made for these factors it would be found that a condenser rated at 6,000 kVA would be sufficient (as shown in the accompanying graph).

The reduction in losses in line, transformers and generator would partly offset the losses in the synchronous condenser, but the net loss should be capitalised to make a true comparison of the cost of the synchronous condenser with that of alternative methods of transmitting the desired amount of power, *e.g.*, larger transformers,

more transmission lines and increased generating capacity, bearing in mind that the synchronous condenser maintains constant received voltage, whereas the alternatives do not. The kW losses in synchronous condensers of modern design are, however, relatively low; expressed as a percentage of the rated kVA, they vary from about 3·5 per cent. for 2,500-kVA to about 2 per cent. for 25,000-kVA machines.

A further advantage of a synchronous condenser, and a very important one, is that if the line voltage varies from normal, the machine has an inherent tendency to keep it constant, even without any change in excitation. This is because, if the line voltage drops, the condenser immediately draws more leading current so that the voltage tends to be maintained due to the reduced voltage drop in the line. It should be noted that this characteristic is the exact opposite of that of a static condenser, where the corrective current is directly proportional to the applied voltage. Thus a static condenser actually worsens line-voltage regulation, since with a rise in voltage it takes more leading current, tending to raise the voltage still further and *vice versa*.

In the case previously described, primary transmission is by means of radial feeders at 66 kV, stepping down to secondary ring mains at 33 kV, so that the synchronous condenser can be most advantageously connected to the tertiary winding of a three-winding transformer and wound for, say, 11 kV or 6·6 kV. The transformer substation would usually be in a sparsely populated area and hence of the outdoor type. The synchronous condenser and its associated equipment is normally designed for indoor installation, but would require only very light protection in the form of a building, which would also house the control equipment for the outdoor substation.

Alternatively the machines could themselves be completely enclosed for installation out of doors, with closed-circuit ventilation and water-cooled air coolers if water is available or air-to-air heat exchangers if it is not. A further possibility is to use the external air for direct cooling of the machines, with heaters in the incoming air duct automatically controlled to maintain the air temperature above freezing point in winter in order to avoid snow being drawn in and blocking the entry.

Installation Equipment Design

Suggested Improvements to Facilitate Maintenance

AN endeavour to indicate how maintenance requirements influence the design of electrical installation equipment, mostly domestic and commercial, though a few comments are included on industrial practice, is made in a paper by MR. HAMLYN DRAKE, submitted to the Installations Section of the I.E.E.

Maintenance engineers are prone to complain that while cables and accessories, switchgear, plant and utilisation appliances are made to be reasonably satisfactory in operation, unnecessary delay is caused when repairs have to be effected, involving unjustified cost which could have been avoided had their designers been more closely in touch with the faults and restrictions encountered by maintenance staffs. In general, complaints fall into the four main categories of insufficient space for wiring, inadequate terminal arrangements, lack of standardisation and lack of appreciation of the innate clumsiness of the general public.

Comment is based on experience of existing equipment, the numerous suggestions for detail improvement being confined to those which are commercially practicable. In some instances it may be thought that the extra initial expense involved cannot be justified, though the author submits that in many cases the cost of modification will be well repaid by reduced maintenance costs during the lives of installations and appliances.

The author does not entirely favour costly material being made more expensive by the necessity for enabling repairs to be carried out quickly. But if much is to be said for equipment (simple and robust) made in the cheapest possible way without facilities for easy maintenance, then its price must be low enough to permit a troublesome item to be replaced by scrapping the whole unit. Such procedure presupposes a high degree of standardisation which, from the maintenance engineer's point of view, is perhaps the most burning question of all. Much delay and irritation are at present due to non-interchangeability of components of similar capacity furnished by different manufacturers.

Fundamental standardisation of dimensions should not cramp the ingenuity and individuality of designers, though many present-day specifications seem to operate in the reverse direction by limiting talent without affording interchangeability. It must be remembered that as the installation trade has developed there has been a steady increase in the ratio of costs of labour to materials, which manufacturers may have lost sight of in their desire to lower the cost of accessories and fittings. Labour costs on site are still rising, so that it is more than ever important to ensure that materials and equipment to be installed shall not add to that growing cost.

Future Generating Practice

Views of Supply Engineers in the United States

REPLIES to queries regarding post-war developments in the generation of electricity, which had been addressed to supply undertakings in the United States having upwards of 16 million kW installed, have been analysed in the *Electrical World* (December 25th, 1943). These show that no material departure from present practice is expected, the general opinion being that for metropolitan systems new units of the largest output suited to local conditions will be added in existing stations to bring overall capacities up to 300,000 to 600,000 kW. For low-density areas, units averaging about 30,000 kW, with a typical maximum of 50,000 kW, will probably be installed in stations containing not more than 200,000 kW of plant.

Standardisation of ratings and basic patterns is generally favoured for turbines, but not for boilers at this stage in view of the many variables to be catered for, such as fuel characteristics. The trend of steam conditions will probably be towards 1,400 lb. per sq. in. and 950-965 deg. F., the latter being the limit set by metals until the full results of wartime advances in metallurgy become available; another limit is that coal with ash of low-fusion temperature introduces slagging troubles in the superheaters with steam temperatures in excess of 750 to 825 deg. F. There seems little inclination yet to go in for steam pressures of 1,750 to 2,500 lb. per sq. in. Where fuel is relatively cheap, increased overall kWh costs have in a few instances outweighed the operating gains due to higher pressures, and reversion to lower pressures seems likely in some smaller plants. Reliability is the most frequently mentioned need.

Thermal Economy Considerations

High fuel costs in relation to capital charges would provide an incentive to strive for higher thermal economy as hitherto. On the other hand, difficulty in raising capital where the return to investors may be regulated, coupled with rise in overall operating expenses, may temper this incentive. Removal from service of obsolescent plant will be another factor in improving average thermal efficiency. It is pointed out that achievement of optimum BThU economy depends on the competence of the operating staffs.

A very definite trend is noticeable towards designing boilers for burning either coal or oil to meet shortages or to take advantage of cost differences. Forced-circulation boilers are viewed as being in the early stages of development, but as promising savings at the highest pressures.

Greater use of automatic controls seems probable in order to promote safe and economical operation and also to reduce wear and tear during fluctuating loads. In most cases these systems have more than fulfilled expectations. Automatic control should only be installed up to the point at which it can function better than human beings and should not relieve the operators of the necessity of thinking. Hope is expressed that improvements in existing designs or electronic devices will enable a reduction to be made in the operating staff and the reliability of the station as a whole to be increased.

Water-Cooling Methods

Dust eliminating plant will be omitted only where the type of fuel does not necessitate it or the public will not be adversely affected. Fly-ash will be removed as early as possible to reduce maintenance of induced-draught-fan blading and ducts. No immediate concern is felt in regard to condensing water. There is reluctance to resort to cooling towers or spray ponds until unavoidable; preference for towers of the forced-draught and induced-draught types is about equal. Views have been expressed that spray ponds are better for larger plants and cooling towers for smaller.

Superimposition of high-pressure sets is expected to prove of relatively small importance in post-war conditions. Mercury turbines are generally regarded as still in the development stage with economy and reliability yet to be assured. Despite the small outputs of internal-combustion engines, there is a growing willingness to consider them as possible adjuncts to steam stations, some commending their use as quick-starting automatic plants in remote areas. Interest is being taken in the gas-turbine as a future potentiality and some hold that it will before long function on a wider range of fuel (including pulverised coal, experiments with which are said to be promising). As it operates at comparatively low pressures, it may permit the utilisation of metals that could not be employed at high pressures, having regard to the high temperatures required. It also needs no water. Thermal efficiencies of 30 per cent. at 1,200 deg. F. are considered possible.

Mobile power plants are thought of as a war development with few prospects for normal application on power systems. Half the undertakings state that the climate

of their territory is too rigorous for the use of outdoor power plant; they hold that personnel and equipment should be protected from the weather and that only fans and dust collectors can be placed externally. Other disadvantages cited are delays in maintenance and increase in operating cost. On the other hand, one quarter of the number, which operate where climatic conditions are more favourable, advocate outdoor construction, one undertaking holding that "outdoor plant should become a reality in all climates."

As an example of modern practice in the United States, reference may be made to a report in the *Electrical World* that the Ohio Power Co. has started the construction of a new generating station on the Ohio River. The first instalment will include two pulverised-coal boilers each with an output of 475,000 lb. of steam per hour at 1,375 lb. per sq. in. and 925 deg. F.; they will be of the dry-bottom type with damper and attemperator control and will serve one 1,800-RPM. single-cylinder turbine coupled to a 100,000-kW hydrogen-cooled alternator.

Domestic Apparatus—III

Opportunities for Achieving Improvements

WHEN at length manufacturers are able to return once again to the production of "munitions of peace" in the form of domestic electrical appliances there will be a transitional period, during which they will probably revert temporarily to their immediate pre-war models. After this time they will be in a position to produce new apparatus of designs more suitable to meet the changed conditions.

Despite the virtual cessation of manufacture of domestic appliances various technical improvements have been in the minds of the designers while they have been engaged on war work, which, incidentally, has provided them with opportunities for studying the possibilities of utilising new materials and processes. Other important modifications and improvements will result from investigations undertaken by E.D.A., B.E.A.M.A., E.A.W. and other bodies. It is the object of this and subsequent articles to try to see in what directions there is the greatest scope and need for improvement, and what progress has already been made.

After dealing with probable manufacturing conditions and the effect of domestic architecture and family habits on the demand for, and design of, electrical appliances, we endeavour to indicate the most promising fields of development

Developments generally seem to fall into two classes. In the first are those which will be more or less obligatory, mainly to meet special post-war requirements, while the second covers technical improvements leading to increased efficiency, reliability and convenience, and more attractive appearance. The "obligatory" developments, to some of which we have referred in a previous article, are principally concerned with the achievement of a certain degree of standardisation or interchangeability.

Standardisation must not mean stagnation. The design of electrical appliances, though generally good, has not yet reached such a high pitch of perfection that the industry can afford to relax its efforts towards improvement. To achieve the highest degree of mass production possible, to reduce prices, and to assist in kitchen planning to overcome the difficulties of a moving population, and most important of all, to facilitate maintenance and repair, it does seem possible that a degree of standardisation is likely to be achieved without interfering to any great extent with future technical developments. The general opinion seems to be that so long as the replaceable parts and some of the dimensions are fixed, manufacturers can be left to please themselves as to other details of construction. In any case there was far too much apparatus produced before the war to meet the whims of individual engineers.

It is mainly on these lines that E.D.A. and B.E.A.M.A. have been working, and it was especially to investigate the matter thoroughly that Mr. E. E. Hoadley, took up his part-time appointment with B.E.A.M.A. a few months ago. This work is beginning to bear fruit and it can now be stated that the manufacturers working in co-operation with E.D.A. have unanimously agreed to deal with three classes of apparatus—cookers, refrigerators and washing machines, which will be standardised as regards external dimensions and will be interchangeable so far as concerns parts likely to need replacement. These appliances will be described as soon as details are available.

The reaching of this agreement is likely to prove a notable milestone in the history of domestic electrical development, and it is evidence not only of the harmony that exists between manufacturers and supply engineers, but also of their determination that the public shall be given what it wants and not have the ideas of a few individuals foisted upon it. In producing the designs every attention has been paid to suggestions from

all sources for improvements and refinements, and the result should be first-class apparatus at the lowest possible price and immeasurably improved service facilities.

It is worth pointing out that this move towards standardisation is quite a different proposition from the attempt made in 1930 to introduce a standard cooker. Then, although several manufacturers approved the design, little effort was made to popularise it. To-day it does seem generally appreciated that the anticipated greatly increased utilisation of the benefits of electricity can only be fully realised and taken advantage of if certain basic designs of apparatus are followed. The degree of standardisation planned is not of such rigidity as to halt further technical developments that must still be anticipated.

New Materials and Methods

From conversations with engineers and manufacturers and from investigations undertaken by various organisations it is possible to get a general impression of the lines on which these further developments will probably take place, though a more complete picture could, of course, be given if it were possible to estimate more exactly the effect on design of the new materials and processes developed during the war. The greater use of plastics and new light alloys, besides affecting constructional details, appearance and technical performance, will also help to reduce weight, an important consideration for such appliances as washing machines, wash boilers, portable radiators, etc.

Even where plastics and light alloys are not used, it might indeed be possible without endangering robustness, to make certain appliances lighter to good purpose. Glass in its new forms may also find some unexpected opportunities in electrical equipment. It has already been used for a radiator and for oven doors, and we have heard it suggested that it would be suitable for refrigerator casings.

Greater Simplicity

Unless fashion undergoes an unexpected change, the main trend of design of all appliances will be towards greater simplicity of appearance, design, control, cleaning, maintenance and repair. Even without standardisation the number of different models of individual appliances will be substantially reduced. The use and availability of apparatus depends to a very large extent on price, and investigations show that the average housewife is quite prepared to do without "frills" in order to get good, sound apparatus at a reasonable price. But it must be good and sound. There must be no tendency to put low price before quality—even if the continuance of the Purchase Tax tends to keep prices unnaturally high. Too often in the past has ill-designed apparatus, in particular radiators, been constructed "down to a price," with bad results for the consumer, the manufacturer and the industry's good name alike. Moreover, only the best appliances are good enough for use in hiring schemes where the wear and tear is notoriously very great.

Short-Life Policy Questionable

On the other hand, it has been questioned whether in the past certain appliances have not been *too* good, and whether manufacturers might not to some extent follow American practice and consider producing models designed for a life of, say, five years, instead of perhaps ten to fifteen years. If it were possible by this means to reduce prices substantially (which is doubtful), the owners, whether the electricity undertaking or the consumers, might be more inclined to scrap their appliances after a reasonable life in favour of improved designs. Quality and price also have a considerable bearing on the design of apparatus intended for the export market.

"Streamlining," employed to a limited degree before the war, will be much extended, especially to meet the requirements of kitchen planning, probably with the result that appearances will be very different. Even in the apparatus produced immediately before the war there were far too many dust and dirt traps, and undesirable sharp edges and protrusions. Neat, well-planned lines not only save time, labour and tempers, but greatly enhance appearance.

Automatic Operation

The less complicated an appliance is the more likely it is to be properly used and less likely to be maltreated and eventually break down. Any additional refinements, such as thermostatic control, which simplify operation and furthermore prevent damage through overheating would seem to be worth while. Thermostats have been much improved in recent years. Apparatus should, in fact, be as nearly as possible automatic, and such that users do not have to "organise their lives around them."

The extra cost of incorporating these improvements, in any case small if undertaken on mass-production lines, is more than compensated for by the improved performance, lower consumption and reduction in maintenance. All these developments are in line with the electricity supply industry's long-declared policy of encouraging efficiency even at the risk of causing a reduction in the sale of electricity.

So much for the more salient features of the design of electrical appliances generally. Later articles will suggest desirable improvements in individual appliances.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT a recent meeting of the National Executive Council of the Electrical Power Engineers' Association, **Mr. W. Arthur Jones,** who has been general secretary of the Association for twenty-five years hinted that he would soon be retiring and that a reorganisation of the secretariat would have to be considered. A number of warm tributes were paid to Mr. Jones and it was decided to set up a sub-committee to deal with the situation which is also affected by a serious shortage of staff.

It was reported with regret at the same meeting that **Mr. Harman Jones** had been compelled by ill-health to relinquish all E.P.E.A. activities.

The triennial award of the Coopers Hill War Memorial prize and medal, which fell in 1943 to the Institution of Electrical Engineers, has been made by the Council to **Mr. Harold Page,** M.Sc., for his paper on "The Measured Performance of Horizontal Dipole Transmitting Arrays." The award for 1943 of the Page prize for the best thesis submitted in lieu of the associate membership examination of the Institution has been made to **Mr. J. V. Beaumont** for his thesis entitled "Types of Power Transformers, with Special Reference to On-Load Voltage Regulators."

At the annual meeting of the National Joint Board for the Electricity Supply Industry held in London on February 25th, **Alderman W. Walker** was re-elected chairman for the twenty-fifth successive year. **Mr. S. Gough,** of the Electrical Power Engineers' Association, was appointed vice-chairman, and he paid tribute to the long and valued service rendered by Alderman Walker. Mr. C. D. Taite, managing director of the Lancashire Electric Power Co., on behalf of the employers, supported Mr. Gough in the recognition of Alderman Walker's twenty-five years' service as chairman.

The Great Yarmouth Corporation is inviting applications for the position of borough electrical engineer to fill the vacancy which will be caused by the retirement of **Mr. P. E. Rycroft,** M.B.E., at the end of May. The salary offered is £1,100 rising by annual increments of £50 to £1,250 per annum.

Mr. P. C. Chaumeton has been appointed to the board of Erinoid, Ltd.

Mr. J. A. MacKerrell has been appointed secretary of the Incorporated Association of Electric Power Companies in succession to the late Mr. Andrew Home-Morton. Mr. MacKerrell, who at present holds the appointment of secretary of the Institute of Municipal Treasurers and Accountants is a fellow and a prizeman of the Society of Incorporated Accountants and Auditors. It is expected that Mr. MacKerrell will be able to assume his new duties on or about May 1st.

Mavor & Coulson, Ltd., electrical engineers, Glasgow, announce the appointment to the board of **Mr. David Jackson** and **Mr. G. Keith Talbot,** both of whom have been with the company for many years. Mr. Jackson, a graduate of Glasgow University, joined it in 1922. He carried out investigations that led to improvements in coal-cutters and cutter chains. He has visited coalfields in many parts of the world, including the United States.

Mr. Talbot was articled at Cannock and Rugeley Collieries, and later was investigator to the Yorkshire Underground Conveyors' Committee. He joined Mavor & Coulson in 1929 and later went to their Sheffield branch, of which he has had charge for the past four years. His travels for Mavor & Coulson have been mainly in Europe.

In our last issue we reported the presentation of a gold watch by Mr. T. Atherton, managing director of Dorman & Smith, Ltd., to **Mr. A. Whitehead,** who has completed fifty years' service with the company. We reproduce herewith a photograph taken on the occasion.

Presentation to Mr. A. Whitehead

Among the speakers at a luncheon in connection with the Aberdeen Corporation Electricity Department's jubilee (*Electrical Review*, March 3rd) were **Mr. J. A. Bell,** who was engineer-in-charge for thirty-eight years, and **Mr. J. B. Morgan,** a member of the original staff, who is now electrical engineer and manager at East Grinstead, Sussex. Mr. Bell recalled that a storm of protest was raised when powers were first sought to run electric tramcars on Sundays. He said that Aberdeen was the second authority in the country to hire out electric motors and the first in Scotland to have an electricity showroom. Aberdeen also created a precedent by supplying electricity outside the city.

Mr. Morgan spoke of the early days and said that they were as proud then of their little

engine room with its five tiny generators as Aberdeen was of its present station.

The toast "The Electricity Undertaking" was proposed by **Sir Thomas Mitchell,** the Lord Provost, who said that he did not think the new hydro-electric scheme for the north of Scotland would affect Aberdeen. **Mr. Alexander Gardner,** the present engineer, also spoke, expressing his appreciation of the loyalty of the staff.

Mr. R. B. Whittick, A.M.I.E.E., informs us that he is opening new offices at Abford House, Wilton Road, Westminster, S.W.1 (telephone, Victoria 5780).

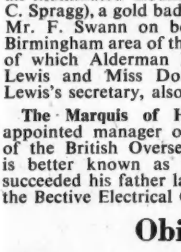
During a visit to the General Electric Co.'s Express Lift works at Northampton recently the vice-chairman, Mr. Leslie Gamage, and the Hon. Mrs. Gamage were introduced to two old employees having a combined service totalling 114 years. One, **Mr. W. A. Birch,** a fitter, has served 60 years and the other, **Mr. C. C. Kitchen,** cost clerk, for 54 years.

Alderman W. S. Lewis, Lord Mayor of Birmingham in 1943, was presented last week with an illuminated album (the work of Councillor C. Spragg), a gold badge and a lamp standard by Mr. F. Swann on behalf of members of the Birmingham area of the Electrical Trades Union, of which Alderman Lewis is secretary. Mrs. Lewis and Miss Dorothy Wright, Alderman Lewis's secretary, also received presentations.

The Marquis of Headfort, who has been appointed manager of the Foynes (Eire) base of the British Overseas Airways Corporation, is better known as the Earl of Bective (he succeeded his father last year) and chairman of the Bective Electrical Co., Ltd.

Obituary

Mr. W. C. Lusk.—In the course of some notes on Mr. William C. Lusk, whose death was reported in our last issue, the British Thomson-Houston Co., Ltd., of which he was chairman, says that Mr. Lusk was insistent upon the importance of research, both as a means of discovering new products and as an aid to improving design and manufacture. During his régime the B.T.H. Laboratory rose from small beginnings to its present important position.

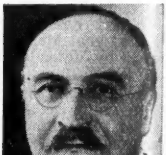


The late Mr. W. C. Lusk

Mr. Lusk was an indefatigable worker and a firm administrator, although shunning the publicity which is offered to most public men. He was deeply respected by his associates and staff, especially those who had known him from the early days of the B.T.H. Company. His quality of mind was analytical, and he quickly got to the heart and sense of the most solid looking array of statistics. He was quick to see and seize upon any flaw in a line of reasoning or argument.

Councillor W. Graham, who died on March 2nd, was the "father" of the Aberdeen Town Council, having entered municipal life in 1921 and served continuously since then. He became a member of the Electricity Committee in 1924, was appointed convener in 1928 and held this office until the time of his death. He took a keen interest in the undertaking and much regretted that he was unable to attend the official celebration of the jubilee on February 28th having been taken ill three days before. He was a member of the Scottish District Joint Industrial Council and Joint Board, and a member of the Executive Committee of the Scottish Centre of the I.M.E.A.

Dr. L. H. Baekeland, whose death was recorded in our last issue, will be chiefly remembered for his pioneer work in the production of plastics. Earlier, however, he was also concerned, as consulting chemist, in the development of the Townsend electrolytic cell for the Hooker Electro Chemical Company of Niagara Falls, and he also founded the Nepara Chemical Society and manufactured photographic papers which were his invention. Upon becoming president of the Bakelite Corporation he devoted himself to work on plastics and for his accomplishments in this field honorary degrees were conferred upon him by the Universities of Pittsburgh, Columbia, Brussels and Edinburgh. Among the scientific prizes awarded to him were the Perkin Medal in 1916, the John Scott Medal of the Franklin Institute in 1910, the Nicholls Medal in 1909, the Willard Gibbs Medal in 1913, and in 1938 the Messel Medal of the Society of Chemical Industry. These awards were given for achievements in chemistry. Among his other distinctions Dr. Baekeland was an Officer of the Legion of Honour, France; Commander of the Order of Leopold, Belgium; and an Officer of the Order of the Crown of Belgium.



The late Dr. L. H. Baekeland

Mr. F. E. Phillips.—We regret to learn of the death of Mr. F. E. Phillips, sales manager of the St. Helens Cable & Rubber Co., Ltd. He joined the company in September, 1912, as an outside cable representative and in 1927 was appointed electrical sales manager, becoming general sales manager last year.

Mr. Phillips served throughout the last war and was demobilised with the rank of captain. His health was seriously impaired by this service, and he had suffered from periodic illness in consequence ever since. During the present war he was a company commander in the Home Guard, joining at its inception, and was also Army Welfare Officer for the Slough district.

Mr. F. Holt.—We regret to record the death at the age of sixty-five of Mr. Francis Holt, sales representative of the General Electric Co., Ltd. Mr. Holt joined the G.E.C. on March 1st, 1894, and by a coincidence his death occurred exactly fifty years later, on March 1st, 1944. He joined the company as a boy and rose to be general manager of the General Electric Co. (India), Ltd., in 1913. Twelve years later he returned home to act as the company's sales representative to the electricity supply industry in the South of England.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

"Only Lighting?"

THE suggestion of "Advance Electricity" in your issue of March 3rd, that we should continue in the bad old way by allowing the gas industry to bankrupt itself with wasteful capital expenditure must necessarily have its repercussions on our own industry—a dual disaster which my proposal seeks to avoid. The restrictions I propose will not put the gas industry out of business—far from it—since it only deals with the question of supplies to new houses. Obviously the rate of gas progress may not be so rapid, but neither would their capital outlay and indeed on balance the result may be to their financial advantage.

The much vaunted "freedom of choice" is really a smoke screen (or a gas screen) to cover the real intentions of the gas industry. Whilst chanting this prayer in unison with the Minister of Fuel and Power, they are moving heaven and earth to persuade the "powers-that-be" that in the national interest it is wasteful for coal to be used other than in the making of gas in order that the by-products may be recovered; having achieved this object there will be plenty of gas available to explode the creed of "freedom of choice."

The gas industry has hitherto met the competition of electricity by relying upon its own by-products, but competition in this direction (eliminated during the war) caused it to sit up and take notice. It cannot halt the latter and therefore by roundabout methods, including the setting up of the Ministry of Fuel and Power, it is endeavouring to halt the former.

The public will not be halted, however, and continues to demand cheap and still cheaper electricity, but that achievement will be a long and painfully expensive journey if they are allowed to travel the tortuous pass of double expenditure bearing the Excelsior banner of "Freedom of Choice." Our industry is fiddling with internal trivialities whilst its Rome is burning with gas.

Wimbledon. F. W. PURSE.

Electricity Supply Reorganisation

AFTER hearing and reading numerous comments on and criticisms of the Joint Memorandum on Post-War Reorganisation, including those by the London and Home Counties J.E.A. and your correspondent "Unbiased" (?) in your issue of March 3rd, may I, as a member of the Committee responsible for the preparation of the Memorandum be permitted to make the following observations which, for the sake of brevity, are set forth in paragraph form:—

(1) On June 17th, 1942, Lord Portal, Minister of Works and Planning, stated in the House of Lords that the Government was examining the question of reorganisation of electricity supply from five main points of view, *viz.*:—To secure a better diversity of load; to secure a greater standardisation of voltage; to work towards a uniformity of charge throughout the country; to adopt a common policy with regard to development; and to put the best engineering advice at the disposal of all distributors. The Memorandum was prepared with the above objects in view and has, I suggest, put forward concrete proposals.

(2) It is not humanly possible to put forward proposals of any kind that will not be criticised by certain individuals or groups and therefore we shall get nowhere if we wait for a 100 per cent. agreement. The Joint Memorandum has, however, been prepared and unanimously approved by the accredited representatives of over 85 per cent. of the whole industry representing both large and small undertakings, owned by local authorities and companies; all have been compelled to make concessions on certain matters in order that the Memorandum might include the maximum measure of agreement between them.

(3) It would not have been thought possible in the troublous days of 1936/38, to achieve such a measure of agreement, even within the I.M.E.A. quite apart from the other sections of the industry who are supporting these proposals, and I sincerely hope and believe that these proposals will be approved by a very large majority at the extraordinary general meeting of the I.M.E.A. on March 16th, and that we shall not quibble about minor points when so much agreement has been reached on matters which will undoubtedly be of great benefit to consumers throughout the country.

(4) It could not be expected that agreement could be reached on the questions of ownership and generation but these matters could be dealt with quite independently of the Joint Memorandum which could be put into operation to the benefit of all concerned even in the unlikely event of generation and ownership remaining as at present.

(5) I am not in the least surprised at your editorial comment to the effect that you are becoming weary of the battledore-and-shuttlecock procedure of such bodies as the London & Home Counties J.E.A. In the report on the Memorandum by that body's General Purposes Committee reference is

made to the public demand for a post-war plan for operating electricity supply on a national or regional basis. In my opinion, there is no such demand from the public generally and many consumers fully realise the attention their views, complaints or criticisms would receive under national or regional control when everything would be dealt with in accordance with rules instead of, as at present, on the spot often on their merits.

What the public does demand is standardisation of voltages and more uniformity in tariffs and I am not very concerned whether this latter demand is achieved by the transfer of generating stations to the C.E.B. or by the selected station owners themselves putting forward a satisfactory alternative scheme for substantially greater uniformity in bulk supply charges.

It is suggested that the I.M.E.A. would have been well advised to have consulted other public bodies concerned—including presumably the J.E.A.—before making its recommendations. This suggestion certainly seems somewhat strange from a body which, after being associated in the early stages with the associations responsible for the Memorandum, suddenly, without warning, published and put forward its own proposals when naturally it was not further consulted in the matter.

In conclusion, and speaking personally, I heartily commend the Joint Memorandum for approval and would only add, by way of warning, that many of the alternative proposals from various quarters simply amount to the dishing up once again of a disguised McGowan Report. If this should be put forward, it will once again be met with the same strenuous and uncompromising opposition that it met with in 1936/37.

Newcastle-under-Lyme. A. J. C. DE RENZI,
Engineer & Manager.

The Joint Committee

THIS Committee, which has in the past been known as the Joint Committee of Electricity Supply Associations, has had its attention drawn to certain statements appearing in the Press relating to its activities and to the future representative nature of its membership. In order that the position may be fully understood by the public, I desire to draw attention to the following facts.

The purposes for which the Committee was formed, as set out in the constitution, are as follows :—

To consider any matter of common interest to the electricity supply industry during the war which has been referred to the Committee—(i) By any of the constituent organisations, or in case of urgency, by or on the authority of its president or chairman ; and/or (ii) By any Government Department, the Electricity Commissioners, or any other properly constituted body.

The Committee has, in the past, consisted of representatives of the following electricity supply associations :—The Incorporated Municipal Electrical Association ; the Incorporated Association of Electric Power Companies ; the Provincial Electric Supply Association ; the London Electricity Supply Association ; and the Conference of Joint Electricity Authorities and Joint Boards.

In November last one of the constituent associations, the Incorporated Association of Electric Power Companies, withdrew from the Committee, giving, in writing, as its reason that the Committee had " outlived its usefulness," and not, as has been stated, that it was concentrating unnecessarily on the politics rather than the technical problems of the industry.

Members and associate members of the Power Companies' Association who disagreed with this withdrawal have formed themselves into a group and have, by this means, continued their membership of the Committee and, consequently, their co-operation with the other constituent associations.

The Committee is a body representative of over 90 per cent. of the electricity supply undertakings in the country and, as will be seen from the foregoing, is continuing to function in the manner provided for in its constitution.

*London, W.C.*2. JAS. TOWNLEY,
Chairman,
Joint Committee of Electricity Supply Organisations.

Post-War Street Lighting

AS public lighting engineer for the City of Leeds, I shall be glad to hear from manufacturers of lighting equipment whether, as part of their post-war policy, they have any new suggestions to offer regarding street lighting.

Leeds. C. S. SHAPLEY,
Engineer and General Manager,
Gas Department.

Coventry Electric Club

THE 1944 session of the Coventry Electric Club was opened this week with a lecture on " Lighting and Radio in Commercial Aviation," by Mr. H. K. Bourne, M.Sc., A.M.I.E.E. (B.T.H. Co.). At the next meeting on April 4th, the subject of " Post-War Planning " will be dealt with by Mr. D. E. E. Gibson, the city architect. The Club was formed in 1939 and now has a membership of 100. The meetings are held at the Coventry Corporation Electricity Department's Showrooms, and Mr. F. W. Godden, the Department's chief engineer and manager, is president.

Brazilian Hydro-Electric Plant

Reuter reports that a large hydro-electric power plant has been built in the city of Macabu, as part of a plan to industrialise the State of Rio de Janeiro.

Post-War Extensions

Supply Undertakings Asked for Particulars

IN a letter to authorised electricity undertakings the Electricity Commissioners state that they have under consideration the position which may arise at the end of the war when undertakers will desire to proceed as soon as possible with the carrying out of works or schemes which have been held up by the war.

It cannot be foreseen to what extent there may be a shortage of labour or of particular materials or how far it may be necessary to continue to impose restrictions on capital expenditure, but there may well be a transition period during which both labour and materials will be scarce, and recommendations may have to be made as to the particular works which can be allowed to proceed. The respective urgency of such works will necessarily vary with the circumstances of individual undertakings, but a general order of priority would to some extent be indicated by the year under which the expenditure is entered on a questionnaire, which undertakings are requested to complete and return to the Commissioners before May 31st next. Undertakers are asked to draw attention to any works regarded as of special urgency.

The Commissioners have already been asked to give some indication of the extent of the works contemplated by the electricity supply industry in the immediate post-war years so that the demands of the industry for capital, labour and materials can be assessed in relation to the demands of the country as a whole. It is important, therefore, that the Commissioners should be furnished with particulars of any works electricity undertakers may have in contemplation for commencement at the end of the war, together with estimates of the cost under various main headings.

Utilisation of Reserves

Authorities are asked to give, so far as possible, estimates of expenditure under the various headings for each of the five years following the termination of hostilities in Europe. A uniform basis of cost should be adopted and, for this purpose, apart from land, the estimates should be based on a hypothetical figure of pre-war costs plus 33⅓ per cent. They are also asked to state the proportion of the total expenditure which they estimate can be met from their internal resources, *e.g.*, utilisation of sinking funds, depreciation and reserve funds, etc., without raising new capital.

Information is not required of estimated expenditure on the provision or extension of selected steam generating stations or the provision of new hydro-electric works. This information is being obtained separately from the Central Electricity Board and the North of Scotland Hydro-Electric Board. Estimates are required, however, of expenditure on deferred maintenance and repairs of generating stations or plant, and for the reinstatement and repair of war damage not yet carried out.

It is recognised that expenditure on new development may depend on the distribution of population, the location of industry and new housing development schemes. Apart from any knowledge undertakers may have of any definite plans concerned with these matters, it is suggested that they should consult with the local authorities in their area regarding any probable developments during the five-year period.

Detailed Estimates Not Expected

With regard to the amount of materials likely to be required, the Commissioners have come to the conclusion that it would not be practicable to obtain detailed estimates from individual undertakings, and they will themselves make such estimates as are possible after analysing the "global" figures of expenditure contained in the returns submitted by undertakers, in consultation with representatives of the supply associations.

It is appreciated that the replies to the questionnaire cannot be regarded as more than an intelligent anticipation of prospects based on such information as is available to the undertakings concerned and, therefore, submission of the completed questionnaire need not be contingent on formal approval by the company or council as the case may be, and the undertakers will not be regarded as committed to proceeding with any particular scheme included in the estimates.

The questionnaire asks for details of revenue expenditure for the first five post-war years (deferred maintenance and repairs to power stations, substations and mains); capital expenditure on extensions and connections to consumers from existing mains; consumers' apparatus; reinforcement of systems (including renewal of obsolete equipment); new transmission and distribution development; offices, showrooms and workshops; and change of system or voltage. It also calls for an estimate of the average number of men to be employed by undertakers or contractors on building and capital expenditure work (exclusive of permanent staff); a method of calculating this is suggested.

Concrete Poles

Fabrication and Use as Transmission Line Supports

REINFORCED concrete supports for overhead power lines are the subject of a paper by Messrs. E. C. NEATE and W. F. BOWLING (Riley & Neate, Ltd.) submitted on Wednesday this week to the Transmission Section of the Institution of Electrical Engineers.

The cost of the spun type cast centrifugally in a machine, which was the former mode of manufacture on the continent, is high because of the special plant required ; demand has not yet justified the installation of equipment at various centres in this country. The alternative hand-moulded pole has been erected in fair numbers in this country during the past twelve years. The designs generally adopted appear to have been based on Continental practice and to have given satisfactory service.

Replies to a questionnaire circulated to undertakings known to have used hand-moulded poles are tabulated in the authors' paper. The total route length erected is remarkably small in relation to the large amount of research carried out into their fabrication and use.

Weight and Cost

Concrete poles have hitherto been regarded as suitable substitutes for wood poles, without considering the desirability of modifying the normal span of the line to take advantage of the relative cheapness of the heavier types of concrete poles. The number of failures reported is remarkably small and no final estimate of their life appears to have been made.

The economic length of a reinforced concrete pole appears to be limited to 60 ft. at present, but there is no reason why longer ones should not be fabricated if they are demanded. Their greater weight is an important factor in the cost of a transmission line. Fairly representative figures for any part of this country are an additional cost of £71 per mile for transport of concrete poles when heavy rail charges do not have to be met and an increase of £13 per mile in erection cost.

Tests to Destruction

The authors suggest that standardisation of pole corings should be attempted for this country as a whole in the way proposed by Messrs. Taylor & May (*I.E.E. Journal*, 1943, Vol. 90, Part II, p. 233). Their present paper contains details of experimental poles with an analysis of results of tests to destruction. A graphical method of design is explained and sufficient information is included to enable future work to be undertaken on the basis which has been established. An expression is obtained for the deflection of a pole under load, by means of which it is shown that deflection cannot be regarded as a criterion for proof-test purposes.

Fabrication and erection methods are discussed, concluding with a survey of merits and disadvantages, indicating that final justification is a question of economics. The advantage of concrete over wood poles has never been very apparent in the past. Less maintenance will be involved only if the concrete is so dense as to prevent moisture penetrating to the reinforcing rods, otherwise steel corrosion will cause the concrete to burst. The claim that, since concrete poles are fabricated, better control of their quality can be maintained must be discounted to some extent by the reduction of safety factor to 2·5 permitted by the Electricity Commissioners' Regulations.

Long wood poles are difficult to obtain and are very dear; under present conditions reinforced concrete types are definitely cheaper in long lengths. They do not fracture completely and, even after poles have failed, an emergency supply can be maintained on poles which may require later replacement. From a way-leave point of view amenity claims may be influenced by the use of coloured concrete. There does not appear to be any danger of bird or insect action.

Not Adaptable

Concrete-pole lines tend to be suitable only for important trunk circuits because they are not adaptable when line modifications are required. They are difficult to use at special positions owing to the need for ordering poles with additional corings, which have to be fabricated to suit. The poles are more liable to damage in the event of conductor failure on account of the four-to-one transverse to longitudinal strength ratio, and are not well adapted to withstand torsion loading. They have a negligible second-hand value.

Present circumstances being largely artificial, it is difficult to forecast what may occur after the war. Large stocks of concrete poles can be accumulated, to be drawn upon at short notice, only if standard bolt-hole corings are adapted. Design improvement is limited by the kind of steel available for reinforcement. If a steel could be produced with a yield point of the order of double that of the present high-tensile commercial variety, the weight of reinforced concrete poles could be reduced to compare with that of corresponding wood poles.

COMMERCE and INDUSTRY

Lighting Fittings Claim. *Illegal Supply of Cookers.*

Meter Rents

IN the House of Commons last week Mr. De La Bere asked the Minister of Fuel and Power if he would confer with the authorities with a view to obtaining facts concerning gas and electricity meters on hire to householders, as many of these meters were 20 years old and the original cost had been repaid several times over.

Major Lloyd George pointed out that it was the practice of gas and electricity undertakings in charging meter rents to have regard to other expenses besides the cost of the meter itself, and he could not accept the implication in the first part of Mr. De La Bere's question.

Mr. De La Bere gave notice that he would raise the matter again.

War Damage to Lighting Fittings

Mr. Justice Uthwatt, in the Chancery Court, was last week asked to decide whether damaged electric lamps and fittings constitute "land" within the meaning of the War Damage Act, 1941, and are a proper subject matter for compensation under Part I of the Act. Judgment was reserved.

The point was raised by J. Lyons & Co., Ltd., who had made a claim in respect of war damage to their premises at Ilford. For the company Mr. Wynn Parry, K.C., stated that the matter was of considerable importance and would be of general application. He contended that the articles constituted "land," but the War Damage Commission had disallowed the company's claim for £3 5s. 3d. compensation.

Mr. Justice Uthwatt said that Lyons & Co. were bound to insure and if they did not get the money from the War Damage Commission they would get it from the Board of Trade, but Mr. Wynn Parry replied that in order to raise the matter they deliberately did not insure in respect of these articles.

The Attorney General (Sir Donald Somervell, K.C.) stated that, in effect, he was appearing on behalf of every ratepayer in the country. If Lyons & Co. were right every rating assessment committee, in considering what rent a hypothetical tenant would pay, would assume that the landlord would provide all electric lamps and fittings.

Employing the Disabled

Useful work in restoring incapacitated men and women in industry is being done by Foster Transformers & Switchgear, Ltd. Some particulars of what has been accomplished are given by the company in a report prepared for the local Employment Committee. The first part of this relates to blind persons. The company began by engaging a blind instructor with considerable experience in training blind people. He made a number of suggestions, after an investigation, regarding suitable operations. It was found that the following processes held good scope for blind workers:—Inspection to commercial limits; precision inspection of aircraft components; taping of coils for electrical apparatus; transformer core building; and cutting and punching thin metal sheet. Experience has shown that once blind operators have been fully trained they frequently work more rapidly than sighted persons, due partly, no doubt, to the smaller degree of distraction which they experience.

People who have lost limbs or suffer from other disabilities naturally present a more varied problem, but instances are given of particular cases in which the company has been successful in training men for useful work. It has even been possible to make an efficient welder of a one-armed man by providing him with a specially constructed face shield.

The report stresses that it is as important to "rehabilitate" the mind as to give physical training, and therefore the company has concentrated on providing productive work instead of merely finding disabled people jobs as night-watchmen, gatemen, sweepers, etc.

Supply of Unlicensed Cookers

At Brentford, Middlesex, on March 1st, on summonses for supplying electric cookers and boiling rings (controlled goods) without a Board of Trade licence, Liberty Electrical Products, Ltd., Isleworth, were fined £1,000, with £50 costs. The Argonaut Engineering Co., Ltd., Highgate, was fined £1,500, with £50 costs, for a similar offence.

William Almond, Worcester Park, Surrey, a director of both companies, was fined £5,000 and £50 costs in each case, or six months' imprisonment, the sentences to run consecutively. A month was allowed for payment of the fines.

Mobile Wireless Stations

To equip each of the mobile wireless stations which are now working for the R.A.F. 1¾ cwt. of paper is needed. Those travelling units, which can be brought into action in the early stages of a campaign before land lines can operate, provide high-speed wireless-telegraph communication, and can also be used in conjunction with radiolocation stations. Paper is needed for instructional manuals and reports, as well as for the plotting charts which are such a vital part of modern R.A.F. equipment. Waste paper also plays its part in the manufacture of these mobile stations. For sound and thermal insulation, the walls are lined with building board containing a substantial proportion of waste paper collected from the homes of the country. Bus tickets and soap cartons, old letters and newspapers, all these can help in the job of maintaining communications for our fighters and bombers.

Decimal System and World Trade

Mr. Harry Allcock, M.I.E.E., chairman of the Council of the Decimal Association, has sent us a copy of the Association's pamphlet "World System for World Traders." In this it is contended that this country, if it is to realise its aim of increasing export trade, must abandon its "insular" system of coinage and measurement

in favour of the metric system which foreign customers understand. Measures for encouraging this change-over are proposed and as a preliminary step it is suggested that apothecaries' and troy weights should be abolished altogether; that avoirdupois weights should be expressed in pounds only and lengths in yards only to facilitate conversion to the metric system; and that for capacity a new gallon of 4 litres or " metric quarts " should be established.

Technical Training for Army Cadets

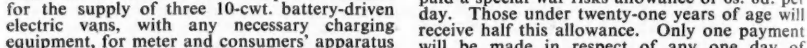
Members of the Army Cadet Force who desire to enter the technical services are to have the opportunity of securing pre-service technical training. Lord Bridgeman, Director-General of the Home Guard, stated in London last week that the new scheme would remove the criticism that while the training for R.A.F. cadets was linked with civil aviation and for naval cadets with the Merchant Navy, there was no such link for army cadets. The scheme would provide a link with civil life in regard to knowledge of the internal combustion engine, radio, electrical equipment and building construction.

Electric Vehicles for Ipswich

Ipswich Electric Supply and Transport Committee has decided to obtain competitive tenders for the supply of three 10-cwt. battery-driven electric vans, with any necessary charging equipment, for meter and consumers' apparatus deliveries generally within the borough. The Committee recognises that many " battery electrics " are being used with economy and success for delivery work and that there would appear to be a growing future for these vehicles.

Henley-on-Thames Exhibition

Many electricity showrooms thoughout the country have been used during the war to draw attention to local activities connected with winning the war and the Henley-on-Thames showroom of the Wessex Electricity Co. has done its full share. Now, during a lull between



Model village at the Henley showrooms

a fuel-saving campaign and " Salute the Soldier " week, the staff is telling the town about electricity supply by means of an impressive display.

The whole story is told by means of posters, photographs and exhibits in separate sections through generation, transmission, transformation and distribution to the work of the meter department and the various uses of electricity for domestic, farming and industrial purposes. Staff activities are also featured, and another section deals with present-day costs and how they have been systematically reduced from the earliest days (recalled by pictures of the Henley Regatta with the oarsmen in top hats).

The staff has shown great ingenuity in the production of models from scrap material. The centrepiece is a true-to-scale model village—the " Village of Much Amenitee," which we illustrate. Among the numerous other exhibits there are various types of insulators ; demonstrations of the damage that can result from various causes, such as pieces of wire being slung up into the air ; the difference between overhead and underground house service ; types of joint boxes and cables ; the evolution of present-day meters ; and modern lighting equipment.

Great appreciation has been shown by the Mayor and officials of the Henley Corporation of the valuable work being done by Mr. Baigent and his staff for the residents of that part of the Wessex Company's area.

Electricians' War Risks Allowance

As from March 6th, for the war period, operatives in the electrical contracting industry sent during the course of their work on trips which necessitate passing to the seaward side of booms or otherwise outside port limits are to be paid a special war risks allowance of 6s. 8d. per day. Those under twenty-one years of age will receive half this allowance. Only one payment will be made in respect of any one day of 24 hours, irrespective of the number of trips taken during the day.

Cutting Compound

To facilitate certain classes of slow-speed machine tool work and many of the manual operations, *e.g.*, hand tapping and screwing, in some of which tool breakages are still comparatively high, a cutting compound by the name of " Trefolex " has been produced and arrangements have now been completed with the makers, the Pearl Varnish Co., Ltd., for the General Electric Co., Ltd., to distribute and deal with all sales of this compound. It is in paste form and is applied to the tool before using, adhering to the work and melting under the frictional heat generated by the cutting process so that a film is spread over the whole of the work and over the cutting edge of the tool also. " Trefolex " is not an abrasive ; it acts as a cooling agent and lubricant and helps to produce clean, polished surfaces. Tests carried out with the compound

have proved conclusively that, not only can some operations be speeded, but tool breakages have been fewer and the lives of small tools have been appreciably lengthened.

Workmen's Compensation

The Workmen's Compensation (Temporary Increases) Act, 1943, which came into force on November 29th, 1943, has added further difficulties to the calculation of the compensation due to workmen in respect of industrial accidents and diseases. These calculations will be much simplified by the use of weekly compensation tables for total incapacity, with notes on the calculation of partial compensation, which have been compiled by W. A. Harper, F.C.I.I., of the Atlas Assurance Co., Ltd., and are published by Eyre & Spottiswoode (Publishers), Ltd., 15, Bedford Street, Strand, W.C.2, price 2s. 6d.

Solder Paints and Creams

For many soldering duties, particularly pre-tinning and sweat soldering, the modern method is to employ solder paint or cream (solder in powder form mixed with flux and embodied in a suitable medium). Their advantages and the types of work for which they are suitable are set out in Information Sheet No. 50 issued by Fry's Metal Foundries, Ltd., Merton Abbey, London, S.W.19. Details are given of "Fryolux" solder paint and cream, and "Fryolene" and "Alcho-Re" solder creams. Pure tin creams and paints are supplied for special purposes (*e.g.*, food containers).

Electrician Killed

An inquest was held at Kingston-on-Thames recently on Leonard George White (29), an electrician, of Malden, who was stated to have received a fatal electric shock while connecting electric cables for battery charging.

Mr. H. J. Banham, supervising engineer, said that Mr. White was working under his instruction and was a very capable electrician. He was connecting cables with switches at the time, and witness found him holding the top part of a connecting cable, the other end of which had fallen below the dead switch to the live part so that he must have received the full 220 V.

The Coroner, in recording a verdict of "Accidental death," said that if the supply had been switched off before the work began the accident would not have happened, but there were good reasons why this had not been done for apparently other work would have suffered.

Apprentice's Death

The Sheriff at an East of Scotland Court held an inquiry on March 2nd into the death of an apprentice electrical engineer who was fatally injured when a mine exploded while he was driving pegs into the ground to mark the position of poles to carry electric wires.

A foreman electrical engineer said that when he took control of the work he had no plans of minefields. He and the apprentice proceeded to their work on the lines indicated on the plan. He did not see any notice boards before the accident.

A representative of the firm gave evidence of carrying out a survey of the ground with the foreman and the apprentice. They did not know the position of the minefield. After the accident he saw notice boards, the nearest about 50 yards and another 150 yards away on the extreme end.

A station engineer said that he told the foreman on two occasions about the minefield, and that other employees of the firm were also informed.

The Sheriff commented that the evidence as to knowledge of the minefield was in direct conflict. It was clear that whoever furnished the plan on which the men were working failed in a great measure by not indicating the existence of a very highly dangerous area. His Lordship added a rider to his formal verdict that some indication should have been given on the plan on which the contractors were working.

Income Tax Deductions

A 40-page guide to the "pay as you earn" system of deducting income tax from wages has been published by the Stationery Office, price 3d. net. The object of the booklet, a foreword to which is written by the Chancellor of the Exchequer, is to provide wage earners with a simple explanation of the new system.

Electrical Year Book

In this year's edition of "The Electrical Year Book" (pp. 337; illus.) new matter has been added on the single-phasing of three-phase induction motors, on commutators in three-phase motors, frequency changers for high-speed drives, and the treatment of load and diversity factors. In the section on electrical measurements there is new matter on DC and AC potentiometers, and new sections have been included on the insulation resistance of live DC systems, and transformer tests, with new matter on field tests of three-phase power factor. A method of finding the capacitance of large condensers has been included. All other features of the previous edition have been brought up to date. The Year Book is published by Emmott & Co., Ltd., *Mechanical World* Office, 78, Palatine Road, Manchester, and 28, Bedford Street, London, W.C.2., price 2s. 6d.

Change of Name

The United Dominions Trust (Electric), Ltd., has changed its name to United Dominions Trust (Commercial), Ltd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

KWICKFIT welding goggles.

MACALLEN BOSTON insulator (from a crane).

ELDERS hangers for overhead cable suspension equipment.

Codes of Practice

Relationship to I.E.E. Regulations

AS there seems to be some confusion as to the scope of the codes of practice now being prepared for various branches of building work and as to the relationship of those concerned with electrical installation to the I.E.E. Wiring Regulations, it may be of service to re-state the position.

After preliminary discussions between the Ministry of Works and Planning (as it was then) and representatives of the professional institutions the Minister initiated an independent "Codes of Practice Committee for Civil Engineering, Public Works, Building and Constructional Work," consisting of nominees of the institutions, the British Standards Institution and the Building Industries National Council, together with assessor members from certain Government Departments. Sir Clement Hindley was appointed independent chairman.

Requirements and Methods of Meeting Them

The codes were not to be of a mandatory nature and they were to be designed to set a standard of good practice in all branches. It has been found necessary to divide the work into two main sections, the first dealing with the functional requirements of buildings.

The requirements for the particular building having been ascertained, the means of securing the results desired will be expressed in a general series of codes forming the second main section of the work. The drafting in the general series is usually entrusted to a code committee covened by the professional institution most concerned with the subject. The first draft is considered by the appropriate sectional committee of the main Codes of Practice Committee, and when approved is promulgated for general comment by the industry. After a period of forty days, comments that have been received will be reviewed and, where desirable, incorporated, before the code is submitted to the main Codes of Practice Committee for approval for publication by the British Standards Institution.

The Institution of Electrical Engineers has convened the code committee for drafting those codes which deal with electrical installation practice, and this work is making rapid headway. To a considerable extent these codes will replace the Institution's Wiring Regulations which were in any case due for early revision.

Before the formation of the Codes of Practice Committee, certain codes were under preparation by other bodies, some intended as permanent documents, while others were designed to meet war conditions. An example of the first type is the code of practice for the protection of structures against lightning, the preparation of which had been initiated by the B.S.I. long before the war. The B.S.I. thought it appropriate to hand it over to the Codes of Practice Committee for approval and subsequent publication. Examples of the temporary type are the War Emergency Codes of Practice for Electrical Installations (B.S.1062–1066) prepared by a committee set up by the I.E.E. Council at the request of the Ministry of Works, subsequent revisions of which have similarly been officially sanctioned by the Codes of Practice Committee. These codes deal with such modifications to normal standard practice as are permissible and often desirable in order to obtain economy in the use of labour and materials, and it was decided by the Council that it would not be appropriate to achieve this purpose by modifying the permanent Wiring Regulations. The Codes of Practice Committee has now made special arrangements to expedite the preparation and promulgation of further War Emergency Codes.

Basic Safety Regulations

The completion of these arrangements for the co-ordination of codes of practice for building crystallised a view that had already been taking shape, that the basic safety requirements of an electrical installation should be separated from any regulations or codes determining good practice. The decision to make the new codes set a standard of *good* practice raised them considerably above the minimum requirement level; it became, therefore, all the more necessary to have in addition basic Regulations, and it is the view of the I.E.E. Post-War Planning Committee that these safety regulations should be compiled and published by the Institution: a view which has been accepted by the Codes of Practice Committee. The safety regulations would be framed in such a way as to omit as far as possible those factors which change from time to time with the development of the science, so that the regulations themselves need not be changed or amended over a very long period of years.

Matters such as current rating tables and others, which are liable to periodic revision, would be dealt with in a supporting code of interpretation, which, though bearing the same force as the regulations themselves, would not need cumbersome machinery to be set in motion to effect a revision. The Council of the Institution has approved the proposal and immediate steps are being taken to carry it through.

Discharges in Dielectrics

Methods of Observation Discussed

IN opening the discussion on methods of observing and analysing internal discharges within insulating materials, described in the paper by Drs. A. E. W. AUSTEN and W. HACKETT to which reference was made last week, MAJOR A. N. ARMAN (Callender's; at present at the War Office) said the principal findings appeared to be very similar, although more developed, to those which he and his colleagues reached some eight years ago. Although it was stated that the oscillograph method was suitable for measurement of discharges, it was rather difficult from the paper to see how quantitative comparative tests could be made rapidly on a series of samples. Some form of indicating instrument measuring directly the amount of discharge present appeared to be much more rapid and convenient for general use. For investigating the case of a single void the oscillograph method was extremely useful. The power factor method was liable to be very misleading.

While he agreed that the discharge rating must be the limiting factor in condensers and cable, that was not the only cause of breakdown. If the impregnating technique were so improved that discharge did not occur, then the rating would have to be assessed on something equivalent to the present B.S. rating.

Criticism of Paper

DR. P. DUNSHEATH (Henley's) criticised the reproduction of some of the illustrations in the paper for they did not support the argument the authors had drawn from them. There was too much tendency on the part of writers of papers on dielectrics to draw model circuit diagrams of condensers and resistances purporting to show the "construction" of the void and then to produce a formula based on those diagrams and to apply that formula to show what was going on in the dielectric. Everybody seemed to do that and they finished up, as the authors had done, by applying the formula not to a practical dielectric but to an artificial one.

The main object of the paper was to produce a new and more sensitive method of detecting the onset of ionisation discharge in gaps. Personally he preferred to treat the subject from the cable point of view and it might be that some of his arguments would not apply generally. He challenged the sensitivity shown by the authors for the power factor method when using the Schering bridge and showed slides in support of his view.

Perhaps the most objectionable part of the paper was that which dealt with the application of the discharge detector, concurrently with power factor measurement, to paper insulated cables. Unless there was something more than was evident from the wording of the paper, then the authors had fallen into a trap. The authors had concluded that the change shown by their test was due to the condition of the dielectric near the conductor, but he was certain that that was not so.

"Unnecessarily Severe"

DR. J. L. MILLER (B. I. Cables, Ltd.), who thought Dr. Dunsheath had been unnecessarily severe on the authors, said that fundamental knowledge of dielectrics was very sketchy; the authors had provided two new tools which were better than those available hitherto. He did not see eye to eye with Dr. Dunsheath with regard to the power factor method, which he regarded as less sensitive than other electrical methods. The authors did not appear to have made up their minds whether ionisation was the only cause of increase of phase angle or not. There was a big difference between cables and condensers; the effects with cables were influenced by handling and the problems were infinitely more difficult.

DR. T. M. ODARENKO (who has been director of U.S. Army and Navy R.F. Cable Coordinating Group) said his interest in the paper was mainly from the point of view of cable engineering. Certain difficulties in America a few years ago led to the development of apparatus similar to that which had been exhibited and it was being used to determine the characteristics of cables on high-voltage systems. All the methods mentioned by the authors had been used, or investigated, in the United States during the past few years and he considered that the Schering bridge or power factor method was the most reliable from the engineering point of view.

Power-factor Method Approved

MR. T. R. SCOTT (Standard Telephones & Cables) thought the authors' greatest fault was that they had shown a tendency to go straight to the question of the life of the dielectric on the basis of a method of investigating something that was, perhaps, a different phenomenon. Going back twenty years in cable history, there was no doubt that the power factor method was absolutely ideal because until the curve was made flat, as Dr. Dunsheath had shown in his slides, there was no hope at all of making a cable which would have any real life. However, they were not quite so foolish as to think that gaseous spaces and voids would be eliminated by

getting the curve flat. It was necessary to find out exactly where they were and what size they were and their relation to other phenomena which occurred in cables. While the authors had provided a useful and highly developed tool for finding out what was happening, they were a little previous in suggesting that their work enabled the life of a cable to be determined.

MR. J. S. FORREST (Central Electricity Board) considered that discharge detection methods were undoubtedly more sensitive than the power factor test, which rather gave an over-all measure of the conditions. Surface discharges gave rise to very similar phenomenon to those inside, but it was not easy to differentiate between the two. In practice, surface breakdowns were much more common and the authors had unduly limited the scope of their paper by dealing with internal discharges only. Many more difficulties must be overcome before discharge detecting methods could be applied to routine testing.

Aural and Visual Systems

DR. K. A. KONSTANTINOWSKY (Standard Telephones & Cables) did not agree with the suggestion that the Schering bridge was sufficient to give all the information required; other bridges were available with much greater sensitivities. He gave some details of tests carried out in the Standard Telephones laboratories, which showed much higher sensitivities with the aural and visual methods than the authors indicated. He claimed a sensitivity up to 50 times more for the aural methods adopted in his laboratory and from 50 to 100 times higher with the visual method. Not one of the methods mentioned in the authors' Table 3 was suitable to give the best over-all information in every case. The value of the comparison made in that table was that it enabled the method most suitable for a particular purpose to be determined.

DR. S. WHITEHEAD (E.R.A.) said that he could not follow what Dr. Dunsheath meant when he spoke of the authors having fallen into a trap. They had aimed at providing a method which would distinguish between internal discharges and other disturbances present and, in his view, they had provided a tool for doing this and had given good reasons.

The problem was associated with a good deal of difficulty on account of the microscopic nature of the phenomenon, but he thought the conclusion could be drawn that material of a type which was chemically affected by corona would be expected to break down due to internal discharges and that material not chemically affected by corona might be capable of breaking down but not necessarily. Each case must be examined on its merits because it was a problem not merely of insulation, but also of the void in the insulation and the way in which the insulation was applied. The paper was very useful in its inference and applications outside the ambit of the particular problem indicated in its title.

MR. W. A. COOK (Bushing Co., Ltd.) said there was one problem which must be solved before the authors' methods could be adopted as a criterion of use, and that was the extent to which the discharges detected by those methods were dangerous to the insulation material and the extent to which they affected the life of the dielectric. No actual ignition voltage was indicated, but he presumed it was of the order of 1,000 V, in which case the margin by which the working voltage could exceed the ignition voltage was relatively quite small. In other forms of insulation that state of affairs did not by any means always exist and it was possible, in some cases, to exceed many times the ignition voltage without danger to the life of the dielectric, within practical limits. That remark applied to synthetic resin bonded paper insulation particularly. Power factor measurements had been sufficient to eliminate almost all breakdowns due to internal discharge. In the case of insulators there had been minor discharges which would have been detected by a more sensitive method, but in actual practice such insulators had survived for twenty or more years, in almost every case without breakdown. A great deal of work had yet to be done to determine under what circumstances discharges could cause the breakdown of insulation.

MR. J. H. GOSDEN (Standard Telephones) amplified the remarks of Dr. Konstantinowsky about his company's tests.

DR. AUSTEN briefly replied to the discussion.

I.E.E. Scholarships

THE Institution of Electrical Engineers will this year make awards of the Duddell and Manville scholarships, each worth £150 a year for three years. They are open to British subjects under nineteen years of age on July 1st, 1944, who have passed the matriculation examination of a British university, or an equivalent examination, and who wish to take a whole-time day course in electrical engineering. A candidate for the Duddell scholarship must be nominated by a corporate member of the Institution, but a candidate for the Manville scholarship should be nominated by the headmaster of his school. Applications for particulars and nomination forms for either of these scholarships should be addressed to the secretary of the I.E.E., Savoy Place, London, W.C. 2. Nomination forms must be returned not later than April 15th. Intending candidates should ascertain from their headmasters if they can comply with the regulations of the Ministry of Labour and National Service to ensure that their age will allow them to proceed with the course of study they propose.

ELECTRICITY SUPPLY

London J.E.A. Charges. N.W. Midlands Service Cables.

Belfast.—FINANCIAL CONTROL.—It is reported that the Electricity Committee has received senior counsel's opinion to the effect that the City Administrators retain full control over the finances of the undertaking; powers under that head do not revert to the committee as a result of the rescission of the Order appointing a Controller over the Department.

Barking.—SWITCHGEAR REPLACEMENT.—The Barking and Ilford Joint Sewerage Board is to replace switchgear at the pumping station at an estimated cost of £1,900.

Elland.—INCREASED LIGHTING ESTIMATE.—The Council recently approved estimates for the coming year which include £2,000 for public lighting. This compares with £200 for the past year.

Faversham.—INSTRUCTION IN ELECTRIC COOKING.—At a meeting of the Education Committee Councillor H. Knowles drew attention to the desirability of including electric cooking in the curriculum of the Domestic Subjects Centre. It was decided to obtain a report from the electrical engineer on the possibility of obtaining an electric cooker.

Hull.—ASSISTED WIRING PAYMENTS.—Where a bombed-out family has been given the tenancy of a Council house in which the repayment charges for the electrical installation have not been completed, it is proposed that the following procedure shall be adopted :—If the incoming tenant has come from a house in which he has completed paying for an assisted wiring installation, he will not be called upon to pay any further charges; the amount outstanding on the installation in the house he has taken over will be met in appropriate cases by the Housing Committee. If he had not concluded the repayments, such charges must be completed, the Housing Committee meeting in appropriate cases the balance outstanding in respect of the house taken over. Where a tenant has not had any responsibility for an assisted wiring installation he will be required, as at present, to take over responsibility for the repayment charges.

Leeds.—COAL CLAUSE.—It is proposed, subject to the approval of the Minister of Fuel and Power, that a coal clause shall be included in the scale of charges for the supply of electricity for power purposes. The recommended adjustment is 0·0008d. per kWh for each penny per ton variation in the cost of coal delivered to the Electricity Department after December 1st, 1943, above or below 26s. 5d. per ton, the alteration to take effect from the first meter readings after March 1st.

London.—J.E.A.'s ACCOUNTS.—At the meeting of the London and Home Counties Joint Electricity Authority held on March 2nd, Mr. T. H. Jones, chairman of the Finance Committee, in submitting the accounts for 1943, said that the Authority had a small but satisfactory net surplus on the year's operations, after making all necessary provisions. Despite the substantially increased costs of fuel and other unavoidable increases in the expenditure of the Authority, there was no necessity, so far as could be seen at present, to contemplate higher charges to consumers. The majority of domestic consumers continued to receive supplies at relatively low rates on the two-part tariff. Interest had been paid in full and up to date on all the Authority's capital, and of the total capital raised provision by way of sinking funds now amounted to considerably more than one-third.

ADDITIONAL SUPPLY.—Hackney Electricity Committee is to lay cable and provide a transformer and equipment at a cost of £1,750 for an additional supply to W. J. Bush & Co., Ltd., in Ash Grove.

North West Midlands.—FREE SERVICE CABLES.—At its meeting on March 1st the Technical Operating Committee of the North West Midlands J.E.A. considered the report of the I.E.E. Post-War Planning Committee on Electricity Supply, Distribution and Installation, with particular reference to the section dealing with charges for services in urban and rural areas. Whereas the Committee recommends that the most satisfactory arrangement would be for all services to consumers' premises to be provided free, the Authority decided to grant a more liberal service line free, but to retain a charge in order to provide for any exceptional case which might arise. Information obtained from nine local undertakings showed that the free lengths of service cable varied from 60 ft. measured from the centre of the footpath outside the premises to 12 ft. free on private property. Three of the undertakings made similar concessions but all the rest were different. The Authority thought it most unlikely that the undertaking granting the longest length of free underground service cable would reduce the length in order to obtain uniformity, and the Authority therefore decided to increase the length of cable laid without charge, to comply with that given by the most generous undertaking. With regard to overhead service lines, the equivalent length of overhead service which could be provided at about the same cost was 200 ft. The adoption of this standard meant that practically all services would be given free of charge in the Authority's distribution area. It was pointed out finally, that whilst complying with the recommendations of the Committee, the granting of the additional length of service line free of charge would assist materially in the post-war development of electricity in the distribution area.

Spalding.—PRICE REDUCTION.—The Urban District Council has reduced the lighting flat rate by ½d. per kWh as from the March meter readings.

Overseas

Eire.—EXPENDITURE ON POWER SCHEMES.—Mr. Lemass, Minister for Industry and Commerce, replying to Deputy McGilligan in the Dail, stated that the cost of the Poulaphouca scheme (estimated at £760,000 in 1936) to date was £1,211,822. This was divided as follows :

Dam and civil construction (completed), £466,744; road, bridges, land purchase, etc. (completed), £435,152; and mechanical and electrical equipment and works, £307,896. For the completion of the equipment and works a further sum of £60,000 would be needed. The Minister further stated that £6,110 had been spent by the Electricity Supply Board on the survey and acquisition of the Clonsast generating station site, and on a railway siding not completed. The maximum quantity of turf, suitable for a generating station, won in any year at Clonsast was 45,000 tons. This would be considerably increased when the remainder of the machinery was delivered. With reference to the average loss, the Minister said that it was 35s. per ton, but the cost would be greatly reduced when the output reached its maximum.

Forthcoming Events

Saturday, March 11th.—*London.*—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Association of Supervising Electrical Engineers. Annual luncheon.

Leeds.—Griffin Hotel, 2.30 p.m. I.E.E. North Midland Students' Section. "Problems Afternoon."

Monday, March 13th.—*London.*—Austrian Centre, 69, Eton Avenue, N.W.3, 7.15 p.m. Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. "Chemical Constitution and Physical Properties of Materials," Dr. K. Weissenberg (in English).

Newcastle-on-Tyne.—Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Instrument Transformers," by Mr. A. Hobson.

Cardiff.—At South Wales Institute of Engineers. I.E.E. Western Centre. "Transmission and Distribution of Electricity to Mines," by Mr. B. L. Metcalf.

Derby.—School of Arts Lecture Theatre, Green Lane, 6.30 p.m. Derby Society of Engineers. "Coal—Constitution and Combustion," by Dr. E. S. Gyngell.

Tuesday, March 14th.—*London.*—Burlington House, W.1 (Geological Society Rooms), 2.30 p.m. Institution of Chemical Engineers and Chemical Engineering Group. "The Welded Joint in Non-Ferrous Chemical Plant," by Mr. W. K. B. Marshall.

London.—At R.S.A., John Adam Street, Adelphi, 5.30 p.m. Illuminating Engineering Society. "Lighting of the Homes of Tomorrow," by Mr. J. B. Carne.

Wednesday, March 15th.—*London.*—At Institution of Electrical Engineers, 7 p.m. London Students' Section. "Electrical Engineering Research," by Mr. H. W. H. Warren.

London.—John Adam Street, Adelphi, W.C.2, 1.45 p.m. Royal Society of Arts. "Gutta Percha and Balata, with Special Reference to their use in Submarine Cable Manufacture," by Mr. J. N. Dean (Telegraph Construction & Maintenance Co.).

London.—At Institution of Mechanical Engineers, 11 a.m. Institute of Metals. Annual general meeting. 2.30 p.m. "Modern Views of Alloys and their Possible Application," by Dr. W. Hume-Rothery, F.R.S.

London.—School of Hygiene and Tropical Medicine, Keppel Street, 2.30 p.m. Society of Chemical Industry, Plastics Group. "X-ray Examination of Plastics," by Dr. W. T. Astbury.

Birmingham.—At James Watt Institute, 2.30 p.m. Institute of Fuel. "Steam Plant Scale," by Mr. W. F. Gerrard.

Chester.—Grosvenor Museum, 2.30 p.m. Institute of Fuel. "Tests on Lancashire and Water-Tube Boilers Using Various Grades of Fuel," by Messrs. P. W. Cattell and H. E. Dudley.

Edinburgh.—Heriot-Watt College, 6 p.m. I.E.E. Scottish Centre. "University Education and Industrial Training of Engineers, with Particular Reference to Telecommunications," by Prof. Willis Jackson.

Thursday, March 16th.—*London.*—At Institution of Electrical Engineers, 5.30 p.m. Ordinary meeting. "Analysis of the Load on a Modern Electricity Supply System," by Mr. P. Schiller.

London.—Caxton Hall, S.W.1, 10 a.m. I.M.E.A. Extraordinary general meeting to discuss electricity supply reorganisation.

Stafford.—Association Hall, English Electric Co., 7 p.m. I.E.E. South Midland Students' Section. "Introduction to Circuit Diagrams" (as applied to heavy electrical engineering), by Mr. A. J. Lund.

Pontypridd.—Association of Mining Electrical & Mechanical Engineers, South Wales Branch. Visit of Mr. G. M. Harvey, Chief Electrical Inspector of Mines, and discussion on his annual report.

Cardiff.—Corporation Demonstration Theatre, The Hayes, 3 p.m. Illuminating Engineering Society. "Ultra-Violet Rays and their Effect on Micro-Organisms," by Prof. Picken.

Friday, March 17th.—*London.*—Connaught Rooms, W.C.2, 12.15 for 12.45 p.m. British Electrical Development Association. Annual luncheon. 3 p.m. Annual general meeting.

London.—At Institution of Electrical Engineers, 5.30 p.m. Measurements Section. "Developments of Railway Signalling on London Transport," by Mr. R. Dell.

London.—Albemarle Street, W.1, 5 p.m. Royal Institution. "Evolution of the Pocket Watch," by Mr. Howard Marryat.

London.—At Institution of Mechanical Engineers, S.W.1, 5.30 p.m. General meeting. Short papers on "Some Modern Aids in the Investigation of the Behaviour of Materials, Mechanisms and Structures."

Manchester.—At Engineers' Club, 6.30 p.m. Women's Engineering Society. "Welding Development," by Miss C. M. Thyne.

Saturday, March 18th.—*London.*—At R.S.A., Adelphi, W.C.2, 3 p.m. Institution of Electronics. "Thermionic Valve Rectifiers," by Mr. F. E. Henderson.

Manchester.—At Engineers' Club, 2.30 p.m. I.E.E. North-Western Centre. "Internal Discharges in Dielectrics," by Dr. A. E. W. Austen and Miss W. Hackett, Ph.D.

Monday, March 20th.—*London.*—At I.E.E., 5.30 p.m. Informal meeting. Discussion on "Industry's Opportunity in Education," to be opened by Dr. P. Dunsheath, O.B.E.

Birmingham.—Birmingham Electric Club. "Fifty Years in the Electrical Industry," by Mr. W. E. Warrilow.

Selected Stations

Views on I.M.E.A. Proposal

THE proposal in the I.M.E.A. memorandum that all authorised generating stations shall be transferred to the C.E.B. was discussed at a recent meeting of the Swansea Corporation Electricity Committee, when a report on the conference held by authorities owning selected stations was submitted.

The chief engineer and manager (Mr. H. E. Blackiston) said that selected stations distributed 74 per cent. of the power produced by municipal stations, but 85 per cent. of the members of the I.M.E.A. who had votes did not own stations, being merely distributors. The proposal was made by these non-station-owning authorities with the intention of taking away from station-owning authorities their right to buy electricity at cheaper rates.

A resolution was proposed that the committee go all out for nationalisation, and during discussion Mr. Blackiston expressed the view that regionalisation would not suit Wales which should either have complete nationalisation or be allowed to remain as at present. It would be impossible to expect four major undertakings in South Wales to carry the rural districts of the Principality.

Eventually the committee decided to hold a special meeting to consider the matter further.

The Luton Electricity Committee considers that the operation and ownership of selected generating stations by the C.E.B. should be the subject of an impartial inquiry which should call for expert evidence from all interests concerned, and that, until the findings of such an inquiry have been published, proposals for the post-war reorganisation of the industry should omit any recommendation that the Board should take over generating stations at present owned and operated by undertakings.

A statement on these lines was made by Councillor A. W. Gregory, chairman of the Committee, at a meeting of the Town Council. He said that the Committee agreed with the suggestion in a report by the I.M.E.A. that the ownership of all undertakings should be public responsibility, but it was not in sympathy with the further suggestion that generation should be handed over to the Board. The Committee felt that the case had not been proved that the handing over of selected stations would result in improvement to the consumers. He added that since the meeting of the Committee there had been a conference of selected station owners which resolved to reject and oppose the proposal and that the Committee had decided to support this.

With regard to reorganisation generally, the Town Council authorised Councillor Gregory and the borough electrical engineer (Mr. C. T. Melling) to co-operate with any other undertakings in support of any scheme which provides for improvement of the operational efficiency of the industry and the service to the consumers; the co-ordination of undertakings into rational and economic groupings; and the eventual public control and ownership of the industry.

Gas-pressure Cable

Jointing Demonstration

A DEMONSTRATION of jointing of a 0·15 sq. in. three-core 33-kV gas-pressure cable, which was being laid by Callender's Cable & Construction Co., Ltd., was recently given to electrical engineers of neighbouring undertakings on the invitation of the North West Midlands Joint Electricity Authority. The cable operates under a nitrogen-gas pressure of 200 lb. per sq. in., and is reinforced with two copper tapes to counteract circumferential stress and one copper tape to meet longitudinal stress; it is served overall with rubber, fabric in bitumen, rubber, hessian in bitumen and, finally, bitumen.

Present at the demonstration. Left to right: Alderman H. Leason, Mr. H. W. Grimmitt, Mr. W. Hancock, chairman of the Technical Operating Committee of the J.E.A., Mr. F. Favell and Mr. C. H. Frankland (Callender's)

After details of the scheme and of the cable had been given by Mr. F. Favell (chief engineer and manager of the J.E.A.), and Mr. P. M. Hollinsworth (Callender's Wood Lane Research Station) the party called at a substation, which contains 33-kV 750-MVA armour-clad switchgear, where the condition of the equipment was examined in the light of the I.E.E. paper on "The Ventilation of Substations," by Messrs. F. Favell and E. W. Connon (*I.E.E. Journal*, October, 1943, Pt. 2). The party then proceeded to another substation where the cable had been laid and the jointing of a straight joint and set of terminal equipments was inspected in progress. At this substation—a 33-kV low-level switching structure—Lapp insulators are fitted with impulse-voltage polarity-equalising gaps; the control cabinet for the gas-pressure cable is also installed there.

At a subsequent luncheon, in replying to the welcome extended by Alderman H. Leason, A.M.I.E.E. (chairman of the J.E.A.), Mr. H. W. Grimmitt (Electricity Commission) congratulated the Authority on the excellent progress it had maintained, particularly in its rural districts. Pointing out that the war had retarded transmission and distribution, he urged that every preparation should be made for meeting the considerable expansion to be expected at the end of the war when the use of gas-pressure cables would be seriously considered.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Power Securities Corporation, Ltd., held its annual meeting on March 2nd. Mr. W. Shearer, the chairman, paid a tribute to the late Mr. W. C. Lusk who was a director of the company. Proceeding, he said that the activities of the company and its subsidiaries had again been almost entirely directed to the execution of works of national importance and their total value had amounted to about £3,000,000. Their usual financial activities had again been restricted.

Mr. Shearer went on to refer to the necessity for the encouragement of personal initiative in the development of their kind of enterprises in the Empire and certain foreign countries. If wartime controls were relaxed to the utmost possible extent it would contribute very largely to employment and prosperity at home. Big changes in the world's markets were inevitable and unless we could establish new openings and by ingenuity and research make attractive to the world's markets distinct and reliable manufactures at the right price, we could not sustain our present population at the standard to which it had become accustomed. Meanwhile we could not afford to commit ourselves to Utopian schemes which were being advanced for the alleged betterment of our commercial and social structure.

The Midland Electric Corporation for Power Distribution, Ltd., is maintaining the dividend for the past year at 9 per cent. by a final payment of 6 per cent. In the course of a statement issued with the report Sir Alexander Roger (chairman) refers to the divergent views on the future of electricity supply which have been published and says that unless agreed recommendations are presented to the Minister of Fuel and Power the Minister may have no alternative but to produce his own plan.

The McGowan Committee's report remains the most complete and judicial report upon which to base future action but some of its recommendations are open to different interpretations. A notable example is the suggestion that changes of ownership should be based on size alone, rather than upon both size and efficiency. There is an optimum size for an undertaking. It should not be so large as to remove local interest and personal enthusiasm or so small as to exclude a reasonable variety of load. Efficiency should be determined by charges for supply in relation to the nature of the area and to service provided.

Sir Alexander claims that the Midland Corporation has a record well above the average expressed in terms of service, development, efficiency and low charges.

Bruce Peebles & Co., Ltd., report that the profit for 1943, after providing for taxation and administrative expenses, was £39,737, against £39,565 for 1942. Of this £20,000 (against £19,000) is placed to depreciation reserve and after meeting the preference (10 per cent.) and ordinary (8 per cent.) dividends there is a balance of £407. This is added to the amount brought forward (£11,875) and the total of £12,282 is carried to the next account.

R. B. Pullin & Co., Ltd., report a trading profit of £131,786 for 1942-43, against £107,087 for the preceding year. After meeting depreciation, taxation, interim dividend, etc., there remains a balance of £14,562 (£26,407). Reserve receives £6,000 (against £10,000) and the final dividend is 15 per cent., again making 20 per cent. for the year.

Waygood-Otis, Ltd., announces a final dividend of 17½ per cent., maintaining the distribution for the past year at 27½ per cent.

The net profit for the year was £85,309, against £77,521, after placing £10,000 to pensions reserve.

Hoover, Ltd., announce an increase in profit from £322,601 to £452, 659, before providing for taxation. The distribution for the past year is maintained at 15 per cent. by a final payment of 11⅞ per cent. and in addition a cash bonus of 5 per cent. is being paid.

The Mersey Railway Co. reports a net revenue of £109,976 for the past year (against £109,961). The full dividend of 3 per cent. is paid on the preference stock and a dividend of 2⅜ per cent. (same) is recommended on the consolidated ordinary stock.

The Midland Electric Manufacturing Co., Ltd., announces a profit of £46,394 (against £44,608). The distribution is again 10 per cent., plus a bonus of 15 per cent.

The Bournemouth & Poole Electricity Supply Co., Ltd., is again paying a final dividend of 7½ per cent., making 12½ per cent. for the past year (same).

The Northmet Power Co. is to pay a final dividend of 4 per cent. on its ordinary stock, again making 7 per cent. for the year.

The Llanelly & District Electric Supply Co., Ltd., has declared an ordinary dividend of 6 per cent. for 1943 (same).

The Newcastle & District Electric Lighting Co., Ltd., has declared a dividend of 7 per cent. for the past year (same).

The South Metropolitan Electric Light & Power Co., Ltd., is repeating its dividend of 7 per cent.

S. Guiterman & Co., Ltd., have again declared a dividend of 10 per cent.

Switchgear & Cowans, Ltd., are maintaining their distribution for the past year at 20 per cent.

Crabtree Electrical Industries, Ltd., are again paying an interim dividend of 5 per cent.

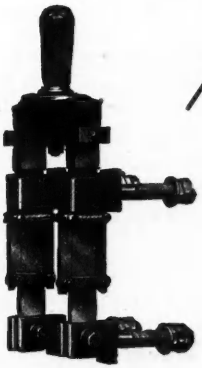
The National Gas & Oil Engine Co., Ltd., is again paying an ordinary dividend of 5 per cent.

New Companies

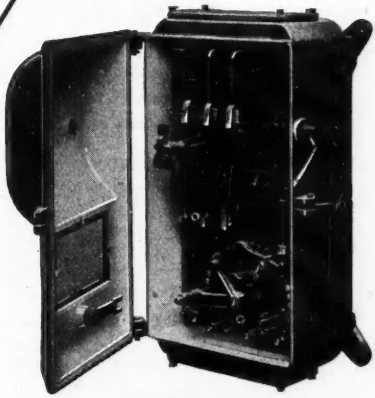
Graseby Instruments, Ltd.—Private company. Registered February 25th. Capital, £30,000. Objects: To acquire the business of electrical and mechanical engineers and designers carried on by R. C. Graseby and G. A. Sharman, and

THE VERITY RANGE

MOTORS



SWITCHGEAR



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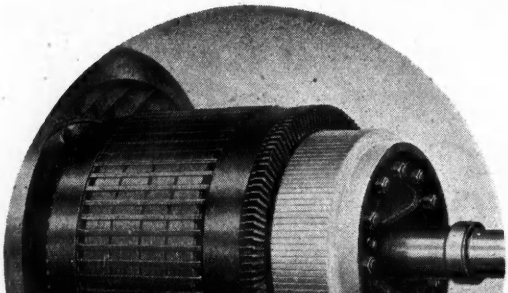

OBSTINATE SURVIVAL

The "Comm. Gang" at our Works still finds plenty to do.* There are still customers who insist on having D.C. motors for circumstances in which they are more suitable or convenient than A.C. motors.

It is not true that we invented the D.C. motor ; but we did a lot to take it out of the string and sealing wax era and to put it to work in the service of industry. So far as we are concerned the D.C. machine is very much alive, and if you have a motor application which seems to call for D.C. we suggest you put your requirements up to us because very probably we have met them before during the past 60 years.

* Helped to some extent by requirements for commutators for L.S.E. variable speed A.C. motors.

LAURENCE, SCOTT & ELECTROMOTORS LTD.

NORWICH, MANCHESTER L.S.E. LONDON & BRANCHES

to carry on the business of manufacturers of, and dealers in, motor components, radio equipment, optical and scientific instruments, etc. Directors: R. C. Graseby, Itchenor Park, near Chichester; and G. A. Sharman, The Oast, Itchenor Road, Birdham, Sussex. Solicitors: Bulcraig & Davis, Amberley House, W.C.2. Registered office: Itchenor Park, Itchenor, Sussex.

Southern Refrigeration, Ltd.—Private company. Registered February 24th. Capital, £4,000. Objects: To carry on the business of distributors of refrigerators, electric or gas-operated or controlled appliances, etc. Directors: A. E. S. Wooldridge and Mrs. Edith H. Wooldridge, both of West Winds, Oatlands Chase, Weybridge, Surrey. Registered office: 3, Albemarle Street, W.1.

W. G. Russell (Lamp Shades), Ltd.—Private company. Registered January 26th. Capital, £500. Objects: To acquire the business of a lampshade frame, lampshade, lamp standard, etc., manufacturer, and wire worker carried on by Walter G. Russell at King Charles Crescent, Surbiton. Directors: W. G. Russell, 60, Northcote Avenue, Tolworth, Surrey; and G. J. Bull, 32, Carver Road, S.E.24. Registered office: King Charles Crescent, Surbiton, Surrey.

Steels Engineering Installations, Ltd.—Private company. Registered February 9th. Capital, £100. Objects: To carry on the business of heating, ventilating, electrical, refrigerating and hydraulic engineers, etc. The first directors are: J. R. Steel, Scargill Lodge, Barnard Castle, and four others. Registered office: Crown Works, Sunderland.

Electrons, Ltd.—Private company. Registered February 15th. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers and workers in, display crafts, luminous and fluorescent paints, neon advertising and lighting, tubing equipment and electrical supplies; floodlighting specialists, manufacturers and repairers of advertising media, etc. Directors: H. A. Reeves, 161, Maida Vale, W.9; and P. De Solla, 2, Hillside Court, Finchley Road, N.W.3. Registered office: 13, Maida Vale, W.9.

Veale-Nixon, Ltd.—Private company. Registered February 23rd. Capital, £2,000. Objects: To acquire the business of electrical contractors and engineers carried on as Veale-Nixon at 19, Saville Row, Newcastle-on-Tyne, 1. Directors: N. Veale, 18, Redewater Road, and J. H. Nixon, 2, Maudlin Place, Newcastle - on - Tyne. Secretary: W. Kirkup. Registered office: 19, Saville Row, Newcastle-on-Tyne.

Companies to be Struck Off Register

The names of the following companies will be struck off the Register at the expiration of three months from February 18th unless cause is shown to the contrary:—Corona Lamp Works, Ltd.; Electro Chemical Processes, Ltd.; Goldhawk Electric Co., Ltd.; Radio Components, Ltd.; and Terry's Wireless (1938), Ltd.

The name of the following company will be struck off the Register at the expiration of three months from February 29th, unless cause is shown to the contrary:—Douglas Electric Lighting Co., Ltd.

Companies' Returns

Statements of Capital

Ferranti, Ltd.—Capital, £900,000 in £400,000 ordinary stock and shares in 10s. units and £500,000 7 per cent. cumulative preference stock (£1 units). Return dated December 9th. £300,000 ordinary stock and £500,000 preference stock taken up. £353,834 paid. £446,166 considered as paid. Mortgages and charges: Nil.

Sun Electrical Co., Ltd.—Capital, £250,000 in 125,000 7½ per cent. preference and 125,000 ordinary shares of £1. Return dated January 13th. 125,000 preference and 93,311 ordinary shares taken up. £218,311 paid. Mortgages and charges: Nil.

Rotapex, Ltd.—Capital, £5,000 in £1 shares (all ordinary). Return dated February 7th. 101 shares taken up. £101 paid. Mortgages and charges: Nil.

Double Filaments, Ltd.—Capital, £250 in £1 shares (all ordinary). Return dated December 30th. All shares taken up. £250 paid. Mortgages and charges: Nil.

Philips Lamps, Ltd.—Capital, £200,100 in £1 shares. Return dated January 14th. All shares taken up. £200,100 paid. Mortgages and charges: Nil.

Stamford Electrical, Ltd.—Capital, 20,000 in £1 shares. Return dated December 23rd. 7,555 shares taken up. £7,555 paid. Mortgages and charges: £4,000.

Eastern Telegraph Co. (France), Ltd.—Capital, £40,000 in £1 shares. Return dated July 7th (filed August 5th). All shares taken up. £40,000 paid. Mortgages and charges: Nil.

Franklin Electric Co., Ltd.—Capital, £500 in £1 shares. Return dated October 4th. 270 shares taken up. £20 paid. £250 considered as paid. Mortgages and charges: Nil.

S. T. Pemberton & Co., Ltd.—Capital, £2,000 in £1 shares. Return dated December 8th. 1,605 shares taken up. £1,605 paid. Mortgages and charges: Nil.

Electric Driers, Ltd.—Capital, £2,000 in £1 shares. Return dated December 28th. All shares taken up. £1,950 paid. £50 considered as paid. Mortgages and charges: Nil.

H. Church & Co. (Essex), Ltd.—Capital, £7,000 in £1 shares. Return dated December 13th. All shares taken up. £7,000 paid. Mortgages and charges: £3,000 debentures.

Mortgages and Charges

Tucker Installations, Ltd.—Debenture dated February 14th, 1944, to secure all moneys due or to become due from the company to Westminster Bank, Ltd., charged on the company's undertaking and property, present and future, including uncalled capital.

Bankruptcies

W. S. Fray, electrician, carrying on business as R. E. Warren at 1, Albert Road, Torquay.—Application for discharge from bankruptcy to be heard at The Castle, Exeter, on April 13th.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange business is restricted by the expectation of an early opening of the Second Front. Sir Archibald Sinclair, Minister for Air, has definitely stated that the time is drawing near when the expected invasion of Europe will take place. This has emphasised an uncertainty which had previously been acting as a restraint upon interest in stocks and shares. Prices keep remarkably firm, considering the present situation and the fact of the "Salute the Soldier" weeks being near at hand. Recrudescence of enemy air-raids, which at first exercised a depressing effect upon prices of utility, entertainment and other issues, still restrains activity in stocks and shares.

Home Railway Profits

The full figures for the Home railway companies' operations for 1943 are now available. These show that the Government is making, as the saying goes, huge profits out of the railway companies, the guaranteed income to the latter being greatly exceeded by the earnings of the companies. These earnings are mainly due, it is superfluous to state, to war traffic. If the Government is making a good profit on the one hand, it is, on the other hand, itself providing the means for doing so, and, in spite of the protests from holders of junior stocks in the railway companies, the position is well understood. The prices are sufficiently low to afford a high rate of yield on the money as regards the junior stocks, with the single exception of London Passenger Transport "C" where the return is still a little under 5 per cent. The exceptional position of the Transport Board is the explanation put forward to account for the relatively high price.

Electricity Supply

Falls have occurred in City Lights, County of London, Metropolitan, London Electric, London Associated Electric, and Northmets. Most of the declines are of 1s. each, probably representing precautionary measures as much as they reflect selling orders. Outside the London list, prices of ordinary shares are holding their ground. There is still a marked scarcity of supply of shares in the market to meet the demand for provincial and Scottish issues. The overseas section is quiet. Palestine Electric "A" have lost a few pence at £2 and Calcutta Electrics at 37s. are 6d. down.

Radio Shares

Public attention continues to take interest in the post-war prospects of radio companies. The most popular of the group from the investment point of view is Electrical & Musical Industries. The price of the shares has ranged within narrow limits for the past few weeks, having settled down to the neighbourhood of 28s. Three of the principal companies whose shares occupy public attention are E.M.I., Pye and E. K. Cole. Philco, Cossor and various others are also popular. When people are in speculative mood, it is the shares of the last-named companies which draw most of the limelight. In days such as these, investment stocks hold the greater claim upon the public mind, and companies which depend largely upon post-war prospects for their appeal to the investor are thrust somewhat into the background. That they and their shares will come again one of these days is a matter which admits of no doubt. In the meantime, waiting upon the course of national events, prices go softly.

Equipment and Manufacturing

Shares in this section remain a good market. Automatic Telephones are better at 62s. Ericsson Telephones have put on 1s. 9d., rising to 52s. 9d. Hall Telephones at 26s. 3d. have gained the pence. Consolidated Signals hardened to £6 upon notice being drawn to the discrepancy between the price of these shares and that of Westinghouse Brakes. There is still room for improvement in Signals. A rise of 1s. 6d. lifted Walsall Conduits to 46s. General Electrics at 92s. 6d. are 6d. better. Brush ordinary strengthened to 9s. Tube Investments and Associated Electrical ordinary are a few pence to the good. Midland Electric Manufacturing ordinary shares are firm at 6⅝. The company has declared a dividend and bonus making 25 per cent. for the year. This makes a total of £2 10s. gross per £1 share spread equally over ten years.

Laurence, Scott

Laurence, Scott & Electromotors 5s. shares are divided into "A" and "B"; they rank *pari passu* except as regards voting. Four "B" ordinary shares are entitled to one vote; of the "A" ordinary shares, 40 receive one vote. The company's preference shares vote only in certain circumstances. Dividends on the "A" and "B" ordinary are always the same. In each of the two years ended December 31st, 1942, the dividend has been 12½ per cent., following upon dividends of 15 per cent. in each of the four preceding years. Tax has bitten heavily into earnings, but the present price of 13s. is the highest touched since the shares have been in their present 5s. shape. Prior to 1938, the shares were of £1 denomination. The company was formed to carry on the business of electrical engineers, manufacturers of dynamos, motors and electrical apparatus of all kinds. At the present time, there are 1,000 shares of each kind, "A" and "B", on offer at 13s. 6d.,

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ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Mar. 7	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	63/-	..	3 19 4
British Power and Light	6	7	32/6xd	..	4 6 2
City of London	7	5½	26/6xd	−1/-	4 3 0
Clyde Valley	8	8	42/-	..	3 16 0
County of London	8	8	41/-	−6d.	3 18 0
Edmundsons: 7% Pref.	7	7	34/6	..	4 1 4
Ord.	6	6	29/-	..	4 2 9
Elec.Dis.Yorkshire	9	9	45/-xd	+6d.	4 0 0
Elec. Fin. and Securities	12½	12½	55/-	..	4 11 0
Elec. Supply Corporation	10	10	47/-	..	4 5 0
Isle of Thanet	Nil	Nil	18/-	..	—
Lancs. Light and Power	7½	7½	37/-	..	4 1 1
Llanelly Elec.	6	6	24/6xd	..	4 18 0
Lond.Assoc.Electric	4	3	23/-	−1/-	2 12 2
London Electric	6	6	28/-	−1/-	4 5 9
LondonPowerRed. Deb.	5	5	103¼xd	..	4 14 7
Metropolitan E.S.	8	8	41/-	−1/-	3 16 0
Midland Counties	8	8	40,6xd	..	3 19 0
Mid. Elec. Power	9	9	44/6	..	4 0 9
Newcastle Elec.	7	7	31/6	..	4 9 0
North Eastern Elec.: Ordinary	7	7	34/-	..	4 2 4
7% Pref.	7	7	35/-	..	4 0 0
Northampton	10	10	48/-	..	4 3 4
Notting Hill 6% Pref. (£10)	6	Nil	11	..	—
Northmet Power: Ordinary	7	7	38/6	−1/-	3 12 9
6% Pref.	6	6	30/6	..	3 18 8
Richmond Elec.	6	6	26/-	..	4 12 4
Scottish Power	8	8	40/6	..	3 19 0
Southern Areas	5	5	23/-	..	4 7 0
South London	7	7	27/-	..	5 3 8
West Devon	5	5	23/6	..	4 5 0
West Glos.	4½	3½	24/-	..	2 18 4
Yorkshire Elec.	8	8	43/-	..	3 14 5
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	6/-	..	—
Calcutta Elec.	7*	6*	37/-	−6d.	3 4 10
Cawnpore Elec.	10	10	35/-	..	5 14 3
East African Power	7	7	33/-	..	4 4 10
Jerusalem Elec.	7	5	28/6	..	3 10 2
Kalgoorlie (10/-)	5	5	10/-	..	5 0 0
Madras Elec.	4*	Nil	23/6	..	—
Montreal Power	1½	1½	23½	..	6 7 8
Palestine Elec."A"	4*	5*	40/-	−3d.	2 10 0
Perak Hydro-elec.	6	7	10/-	..	—
Shawinigan Power	83cts.	90cts.	16½	..	—
Tokyo Elec. 6%	6	6	18	..	—
Victoria FallsPower	15	15	4¼	..	3 9 7
Whitehall Inv.Pref.	—	6	24/-	..	5 0 0

Company	Dividend Previous	Dividend Last	Middle Price Mar. 7	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity: 1955 60 Civil Defence)	—	2	100	..	3 0 0
1955-75	5	5	114xd	..	4 7 9
1051-73	4½	4½	107	..	4 4 1
1963-93	3½	3½	104	..	3 7 4
1974-94	3½	3½	101	..	3 4 6
London Elec.Trans. Ltd.	2½	2½	97	..	2 11 3
London & Home Counties1955-75	4½	4½	112	..	4 0 4
Lond.Pass.Trans.: A	4½	4½	123½	..	3 13 0
B	5	5	121½	..	4 2 4
C	3	3½	66	..	4 18 6
WestMidlandsJ.E.A. 1948-68	5	5	108¼xd	..	4 12 4
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	118	+1	5 1 8
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/6	..	6 10 7
Cable & Wireless: 5½ Pref.	5½	5½	115	..	4 15 6
Ord.	4	4	80½	..	4 19 5
CanadianMarconi$1	Nil	4cts.	9/-	..	—
Globe Tel.& Tel.: Ord.	8½*	5*	37/-	−6d.	2 14 1
Pref.	6	6	30/-	..	4 0 0
Great NorthernTel. (£10)	Nil	Nil	20½	..	—
Inter. Tel. & Tel.	Nil	Nil	15	..	—
Marconi-Marine	7½	7½	33/-	..	4 11 0
Oriental Tel. Ord.	16	10	44/-	..	—
Telephone Props.	6	Nil	16/-	..	—
Tele.Rentals(5/-)	10	10	11/6	..	4 7 0
Traction and Transport					
Anglo-Arg.Trans.: First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	7	−½	—
Brit.Elec.Traction: Def. Ord.	45	45	1115	..	4 0 7
Pref. Ord.	8	8	175	..	4 11 5
Bristol Trams	10	10	54/-	..	3 14 2
Brazil Traction	$1	$1½	26½	..	6 17 6
Calcutta Trams.	5½	6½	39/-	−6d.	3 6 8
Cape Elec. Trams	5	6	26/-	..	4 12 4
Lancs. Transport	10	10	45/6	+½	4 8 0
Mexican Light: 1st Bonds	5	5	100½	..	4 19 7
Rio 5% Bonds	5	5	106½	..	4 13 9
Southern Rly.: 5% Prefd.	5	5	76½	..	6 10 9
5% Pref.	5	5	117½	..	4 5 1
T. Tilling	10	10	58/-	..	3 9 0
West Riding	10	10	45/-	+6d.	4 9 0

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Mar. 7	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron.Elec.Ord. ..	10	15	55/–	..	5 9 1
Assoc. Elec.:					
Ord.	10	10	52/3	+3d.	3 16 8
Pref.	8	8	39/6	..	4 1 0
AutomaticTel.&Tel.	12½		62/–	+9d.	4 0 8
Babcock & Wilcox	11	11	50/–	..	4 8 0
British Aluminium	10	10	48/–	..	4 3 4
British Insul. Ord.	20	20	5 5/8	..	3 15 4
British Thermostat (5/–)	18½	18½	19/–	..	4 17 4
BritishVac.Cleaner (5/–)	15	30	27/–	..	5 11 1
Brush Ord.(5/–)..	6	8	9/–	+6d.	4 9 0
Burco (5/–) ..	15	17½	15/6	..	5 13 0
Callender's ..	15	20	101/3	..	3 18 9
ChlorideElec.Storage	15	15	80/–	..	3 15 0
Cole, E. K. (5/–)	10	15	25/–	–6d.	3 0 0
Consolidated Signal	24	27½	6	+½	4 11 6
Cossor, A. C. (5/–)	7½*	10*	23/–	..	2 3 6
Crabtree (10/–) ..	17½	17½	38/3	..	4 11 5
Crompton Parkinson Ord. (5/–) ..	20	22½	29/–	..	3 17 7
E.M.I. (10/–) ..	6	8	28/–	..	2 17 2
Elec.Construction	10	12½	50/–	..	5 0 0
EnfieldCableOrd.	12½	12½	58/6	–6d.	4 5 8
English Electric .	10	10	50/6	..	3 19 3
EnsignLamps(5/–)	25	15	20/–	..	3 15 0
Ericsson Tel. (5/–)	22*	20*	52/9	+1/6	1 18 0
Ever Ready (5/–)	40	40	39/–	..	5 2 7
Falk Stadelmann	7½	7½	33/6	..	4 9 7
Ferranti Pref. ..	7	7	30/–	..	4 13 4
G.E.C.:					
Pref.	6½	6½	34/–	..	3 16 6
Ord.	17½	17½	92/6	+6d.	3 15 6
Greenwood&Batley	15	15	41/3	..	7 5 9
HallTelephone(10/–)	12½	12½	26/3	+3d.	4 15 1
Henley's (5/–) ..	20	20	26/3	..	3 16 2
4½% Pref. ..	4½	4½	24/–	..	3 15 9
Hopkinsons ..	15	17½	62/6	..	5 12 0
India Rubber Pref.	5½	5½	21/6	..	5 2 4
Intl. Combustion	30	30	6½	..	4 18 0
Johnson & Phillips	15	15	70/6	..	4 5 2
LancashireDynamo	20	22½	93/–	..	4 16 6
Laurence,Scott(5/–)	12½	12½	13/–	..	4 16 2
London Elec. Wire	7½	7½	34/6	..	4 7 0
Mather & Platt..	10	10	53/9	– 1/6	5 14 9
Metal Industries(B)	5	8	45/–	+9d.	3 11 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	102/6	..	3 18 2
Pye Deferred (5/–)	25	25	26/3	..	4 15 3
Revo (10/–) ..	17½	17½	38/6	..	4 11 0
Reyrolle ..	12½	12½	68/9	..	3 12 8
Siemens Ord. ..	7½	7½	33/–	–6d.	4 11 0
Strand Elec. (5/–)	7½	10	7/9	..	6 9 0
Switchgear& Cowans (5/–) ..	10	20	18/–	..	5 11 1
T.C.C. (10/–) ..	5	5	18/9	..	2 13 4
T.C. & M. ..	10	10	52/–	..	3 17 0
TelephoneMfg.(5/–)	9	9	11/–	..	4 1 10
Thorn Elec. (5/–)	20	20	22/6	..	4 9 0
Tube Investments	20	20	96/6	+3d.	4 3 0
Vactric (5/–) ..	Nil	Nil	14/–	..	—
Veritys (5/–) ..	7½	7½	7/6	..	5 0 0
Vickers (10/–) ..	10	10	18/9	–3d.	5 6 8
WalsallConduits(4/–)	55	55	46/–	+1/6	4 15 9
Ward & Goldstone (5/–)	20	20	26/–	..	3 17 0
WestinghouseBrake	12½	14	70/–	..	4 0 0
West, Allen (5/–)	7½	7½	7/3	..	5 3 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 354)

giving a return of £4 12s. 7d. on the money. The price of the shares at the end of August, 1939, just before war broke out, was 10s. 3d. The dividend last year of 12½ per cent. was paid out of earnings of 23 per cent.

Communication Stocks

Anglo-American Telegraph 6 per cent. preferred is better at 118. Cable & Wireless stocks hold their last week's advance. Globe Telegraph & Trust ordinary at 37s. are 6d. lower upon the realisation of a few thousand shares. At their present price, Globe ordinary return £2 14s. 1d. per cent. net. on the basis of the last-paid dividend of 5 per cent. free of tax. The yield, equivalent to £5 8s. 2d. gross allowing for 10s. tax, is sufficiently satisfactory to merit investment notice.

Ensign and E. K. Cole

The price of Ensign Lamps is nominally unchanged at 20s. on the notification to ordinary shareholders that E. K. Cole has acquired a controlling interest in the Ensign Lamp Company. E. K. Cole has bought to date approximately 224,000 out of the issued 300,000 Ensign Lamps ordinary shares. It is desired to make a complete merger of the two companies and, in order to effect this, E. K. Cole is offering to purchase all the remaining Ensign Lamps ordinary shares, giving five E. K. Cole ordinary for six Ensign Lamp ordinary. Fractions of E. K. Cole are to be paid off in cash at 26s. 3d. per full share. This offer is open until March 20th.

Verb. Sap.

Ensign Lamps recently reduced the previously paid 25 per cent. dividend to 15 per cent. and the price of the shares fell a shilling or two on this announcement. It has kept steadily at 20s. since the beginning of the year. On the 15 per cent. dividend, the return at 20s. is, of course, only 3¾ per cent. E. K. Cole stand at 25s. The company's last dividend of 15 per cent. went against 10 per cent. in the previous year, and at the present price, on the 15 per cent. dividend, the return is no more than 3 per cent. E. K. Cole has a good balance sheet and the post-war prospects for the company are generally held to be promising. The Ensign Lamp holders of the required 76,000 shares will no doubt agree to the terms of the proposed merger.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Abertillery.—March 30th. Electricity Department. Materials, including cables, meters, lamps for public lighting and domestic apparatus, for the year ending March 31st, 1945. (See this issue.)

Kilmarnock.—March 22nd. Town Council. Supply of articles including electric lamps for all the Corporation departments and for street lighting. Forms, etc., from burgh surveyor, 7, Green Street ; tenders to town clerk.

Manchester.—March 22nd. Electricity Committee. Service cut-outs and cables. (March 3rd.)

North-West Midlands.—May 10th. Joint Electricity Authority. Piping equipment and overhead electric cranes. (March 3rd.)

Omagh. — March 25th. Mental Hospital Joint Committee of Management. Supply of electrical requisites and engineering machinery for six months from April 1st. Items are included in a war contract list, which must be applied for. Particulars from, and tenders to, O. L. Walsh, clerk to the Joint Committee of Management, Omagh Mental Hospital.

Stockport.—March 15th. Education Committee. Supply of electric lamps for the period April 1st to September 30th, 1944. All supplies are to be delivered free to the various schools and centres under the control of the local education authority. Form of tender from G. Holgate, director of education, Town Hall.

Wortley.—March 31st. R.D.C. Electrically driven borehole pumping unit. J. Morton, Council Offices, Grenoside, nr. Sheffield.

Orders Placed

Glasgow.—Municipal Transport Committee. Accepted. Double-deck chassis (£8,275).—Transport Vehicles (Daimler). Bow collector plates.—Sievewright, Bacon & Co. (£2,250); North British Steel Foundry (£1,075). Pinions for tramcars.—Moss Gear Co. Carbon brushes.—Morgan Crucible Co. ; Le Carbone.

Guildford.—Finance Committee. Accepted. Internal telephone system at Council offices (£931).—Dictograph Telephones.

Ilford.—Electricity Committee. Accepted. Storage battery replacements (£284).—A. W. Creasey & Co., Ltd., Ilford.

London. — BATTERSEA. — Electricity Committee accepted for twelve months :—Stoneware conduit and protecting slabs.—James Smith Bros. (Pipes), Ltd. Electricity meters.—Chamberlain & Hookham. Joint boxes, house service cut-outs and underground cables.—Callender's. Disconnecting boxes and copper wire.—Henley's. Joint box compound.—Dussek. Electrical wires for installation work.—Stearn Electric Co. Flexible wires and wiring accessories.—Wm. White & Co. Steel sheathing and fixing clips.—Wholesale Electric Co. Conduit and conduit fittings.—Sloan Electric Co. Switches (5A) and cooker control units.—J. A. Crabtree & Co.

Manchester.—Rivers Committee. Accepted. Renewal of electric lighting in subway at Davyhulme sewage works.—E. M. Evans & Sons.

Electricity Committee. Accepted. Extension of ash sluicing plant.—International Combustion. Mild steel fishtails for boiler coal chutes.—John Booth & Sons (Bolton).

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barrhead (Renfrewshire).—Houses (20); burgh surveyor.

Barrow-in-Furness.—Crematorium; F. L. Wooldridge, borough surveyor.

Improvements, new machinery and plant at Ingleton Lakeland Laundry ; Lakeland Laundries, Ltd., Abbey Road.

Birmingham.—Temporary school (£2,475), Cofton Common ; Midland Building Trust, Birmingham.

Blaenavon.—Wartime nursery ; surveyor, Urban Council Offices.

Bradford.—Additions to Children's Hospital ; secretary, General Court of Governors.

Brierley Hill.—Demonstration houses, Brettell Lane, for Durartstone, Ltd., 5, Church Street ; H. Jennings & Homer, architects, 3, Church Street.

Brighouse.—School clinic, Atlas Mill Road ; H. A. Sneezum, borough surveyor.

Bromsgrove.—Houses (12), Middle Lane ; J. W. Harris, The Spinney, Station Road, Wythal.

Croydon.—School canteens (£4,000) ; borough engineer.

Darlington.—Temporary bungalows (50) ; E. Minors, borough engineer.

Dumfries.—Buildings (£1,300) for General Milk Products, Ltd., Carnation Milk Factory; manager.

Enfield.—Additions, Express Motor and Body Works, Great Cambridge Road ; L. Robinson.

Ferryhill.—Miners' hostel ; H. E. Pitt, Ltd., Leopold Street, Millfield, Sunderland.

Guildford.—Factory extensions, Madrid Road ; Weyside Engineering Co., Ltd.

Hebburn-on-Tyne.—Rebuilding day nursery school ; George Carter, Ltd., Carliol House, Newcastle-on-Tyne.

Hull.—Office and laboratory, Dansom Lane ; Reckitt & Colman, Ltd.

Isle of Wight.—Additions, St. Mary's Hospital (£1,525) ; G. H. Williams & Sons, Wootton.

Kitchen, Secondary School, Newport (£1,447); county architect.

Jarrow-on-Tyne.—New light industry; town clerk.

Limehurst.—Council houses (150) for R.D.C.; S. Dennis, surveyor, Council Offices, Oldham Road, Waterloo, Ashton-under-Lyne.

Llanelly.—Proposed joint hospital scheme ; borough surveyor, Town Hall.

Manchester.—X-ray unit and structural alterations to Oxford Road Union Chapel (£5,100); G. Noel Hill, city architect.

Dining centre and kitchen for school meals for 2,500 ; J. B. Brez, chief surveyor, Education Offices, Deansgate.

Middlesbrough. — Houses (15), Roseberry Road ; J. H. Crawford, builder.

Middleton.—Crematorium, Moorclose estate ; J. Pollard, borough engineer and architect, Town Hall.

Morecambe.—Central kitchen and dining hall for 1,000 on Lancaster Road site ; R. B. Savage, borough surveyor.

Newcastle-under-Lyme.—Accommodation for nurses, Bradwell Sanatorium ; secretary, Joint Isolation Board, Bradwell, Newcastle, Staffs.

Rochdale.—Nursery, Castleton recreation ground ; S. H. Morgan, borough surveyor, Town Hall.

Rotherham.—Works additions, Wortley Road; R. Jenkins & Co., Ltd.

Canteen, Canklow Road; J. Brown & Co., Ltd.

Sheffield.—Buildings; M. Bernard & Co., Ltd., wholesale bakers, 54, West Bars Green, Sheffield, 1.

South Shields.—Factory for light electrical equipment ; Barker & Co., contractors, Doncaster.

Pump house for the Tyne Dock Eng. Co., Ltd.; Howard Hill, architect, Winchester Street.

Stretford.—Central school canteen for 1,000 children ; E. Parker, borough engineer, Town Hall.

Swadlincote.—Crematorium ; G. S. Baker, surveyor, Council Offices, Swadlincote, near Burton-on-Trent.

Warrington.—Catholic school ; Priest-in-Charge, St. Mary's, Presbytery.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.*2.

AKT.-GES Brown, Boveri & Cie.—"Vacuum-tight high-temperature annular connection between a metallic and ceramic body." 11236/42. August 15th, 1941. (559429.)

Automatic Telephone & Electric Co., Ltd.—"Telephone systems." 15775/42. December 20th, 1941. (559403.)

British Thomson-Houston Co., Ltd.—"Electric gas-arc heating torches." 18113/42. December 30th, 1941. (559409.) "Protective arrangements for electric apparatus." 9755/43. June 19th, 1942. (559422.)

Callender's Cable & Construction Co., Ltd., R. W. Lunt and G. J. Dean.—"Means for measuring forces acting on a wire-drawing die." 11486. August 17th, 1942. (559381.)

Chloride Electrical Storage Co., Ltd. (C. D. Olson).—"Filling device for electric accumulators." 1410. January 27th, 1943. (559415.)

A. L. Cianchi.—"Magnetically operated electrical switches." 6185. May 7th, 1942. (559453.)

Creed & Co., Ltd., R. D. Salmon and A. A. Kirchel. — "Printing-telegraph apparatus." 11402. August 14th, 1942. (559466.)

Dubilier Condenser Co. (1925), Ltd., A. E. C. Bennett and R. J. Tungay.—"Electrical condensers." 11397. August 14th, 1942. (559376.)

Foster Transformers & Switchgear, Ltd., and F. Morris.—"Snap-action mechanical device applicable to electric switches." 15237. October 30th, 1942. (559437.)

M. F. Freeman.—"Headlamps of motor vehicles or the like." 1593. January 30th, 1943. (559440.)

A. Graham & Co., Ltd., and C. H. Vaughan.—"Telephone systems." 15553. November 4th, 1942. (559438.)

J. Lucas, Ltd., and J. A. Laird.—"Dynamo regulators." 11298. August 12th, 1942. (559375.)

Marconi's Wireless Telegraph Co., Ltd.—"Adjustable inductance devices." 7291/42. May 31st, 1941. (559330.) "Electron-discharge devices such as cathode-ray tubes." 7922/42. May 9th, 1941. (559331.) "Ultra-short-wave aerials." 18033/42. December 20th, 1941. (Addition to 528817.) (559471.)

E. Mestitz and Elco (Treforest), Ltd.—"Electric soldering irons and the like." 11816. August 21st, 1942. (559382.)

Philco Radio & Television Corporation.—"High-frequency antenna system." 16060/41. December 14th, 1940. (559423.)

Platers & Stampers, Ltd. (E. Katzinger Co.)—"Electric flash-lights and focusing lamp assemblies therefor." 9640. July 10th, 1942. (559334.)

Standard Telephones & Cables, Ltd.—"Electro-magnetically operated step-by-step switches." 1284/43. February 5th, 1942. (559411.) "Prevention of distortion in thermionic valve repeaters." 1533/43. February 5th, 1942. (559417.) "Steatite type ceramic material." 9964/42. April 3rd, 1941. (559462.) "Selenium electric rectifiers." 2782/43. April 3rd, 1942. (559473.)

Standard Telephones & Cables, Ltd., and R. Kelly.—"Power supply systems for carrier communication systems." 11403. August 14th, 1942. (559377.)

G. E. Wood.—"Unspillable vent, particularly for secondary cells." 825. April 23rd, 1943. (559386.)

E. A. Yates.—"Laying of pipes, cables and the like in open trenches." 15172. October 29th, 1942. (Addition to 546270.) (559401.)

Amended Specification

549346. Philips Lamps, Ltd.—"Protective arrangements for electric lamps."